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## Do Government financial and tax policy affect SME's growth?

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**Abstract:** The paper is based on the findings of a research project which aimed to identify the effects of governmental tax and finance policy on small and medium enterprises growth in Iran. To determine the factors that explain SMEs growth in Iran (Case of Ardabil Province), we used factor analysis based on a list of 26 questions about tax, tariffs and governmental policy that asked from 64 SMEs managers. Four dimension identified by factor analysis. Finally, correlation between factors and growth indexes examined. The findings of the study lend support to this claim that incentives and discounts' propriety with growth were the major determinants of the SMEs growth, and had significant relation with all the growth indexes. Differently, the effect of rates of credits on the number of staff revealed negative relationship.

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### 1. Introduction

Small and medium sized enterprises (SME) have competitive privilege for a state or even a geographical area (Mertins, et al; 2006) and have gained considerable attention in today's world economy.

Their efficient allocation of resources work force, assets/ capital and technology in the form of synergy can perform a major role in economy development

It is generally a matter of debate that empirical surveys are not adequate in taking small and medium enterprises into account (Barnes, 2002; Metts, 2007), though SMEs are extremely important for economics and its development (Ebrahim et al., 2009; Ghaderi, et al., 2010); Moreover, there are a small number of empirical research studies focused on understanding the impact of managerial background and perception of performance and the degree to which smaller firms are affected by the strategy awareness of entrepreneurs (Karami et al., 2006). Facing incremental competitive pressure due to globalization, as well as increased quality and service requirements from their customers (Underdown and Talluri, 2002), small- and medium-sized manufacturers must increase their productivity and their competitiveness in order to survive and prosper, even if they do not intend to become "world class" enterprises. Nevertheless, for SMEs it will be difficult to overcome these challenges mainly due to lack of the internal human resources and the traditional culture of poor investment in education and training (Matlay and Hyland, 1999). The SMEs have specific needs, usually more technological and/or organizational based (Mesquita et al., 2000).

This paper shows that governmental strategy allows for conceiving concentrated growth of SMEs.

### 2- SMEs Growth:

#### 2.1 Meanings of growth

The enterprise growth is used to describe a development process of enterprise from small to big and from weak to strong. The meanings of development exceeds the meanings of growth, and it includes not only the growth process of things, but the generation stage growing out of nothing before growth and the periodic process of the stage, i.e. the cycle process going round and round. However, the enterprise growth is a complex adjustment process which is different to the simple scale extension. It takes the balance adjustments of various relations in the interior and the exterior of the enterprise as the essential character, and it is the process of balanced development from unbalance to balance, and from lower balance to higher balance.

Therefore, the concept of enterprise growth denotes the development process that an enterprise goes through to maintain balanced and stable growth in total performance level (including output, sales volume, profit and asset growth) or to realize the large enhancement of total performance and the stage spanning of development quality and level (Sun, 2004; Mao, 2009).

Li Zhicheng and Diao Zhaofeng (2003) put forward the concept of "enterprise growth force" (Li, 2003, P.86-89). They thought that the enterprise growth force means the enterprise's ability and potential to realize the extension of "quantity" and enhance the "quality" in

future period. They believed it could determine the probability and the degree of enterprise development.

Zhang (1998) analyzed the enterprise growth from three angles including scale, diversification and competitive force.

Tang Wenxian and Li Panfeng (2005) analyzed the development course of relative enterprise growth theories from three aspects including scale, knowledge and system, and effectively classified the relative enterprise growth theory (Tang, 2005, P.17-21).

In this study, organizational growth, the dependent variable of the research, was measured by means of two indicators. The first of these, sales growth, was measured by asking the respondent to assess the average increase of sales income in recent 5 years.

The second indicator for organizational growth was personnel growth, measured by the average increase of the number of staff in last 5 years.

## 2.2 Tax Policy

According to Tomlin (2008), economists argue that the resources smaller companies direct towards tax compliance are resources that could be used for reinvestment, facilitating future growth. Hence, there is a belief that taxes and a complex tax system put disproportionate pressure on smaller businesses. According to Coyne (1995), SMEs are generally more responsive to domestic tax incentives than large ones. Taxes may play a more important role in the cost structure of SMEs because they do not have the financial and human capacity to developed sophisticated tax avoidance strategies.

Taxation is popular instrument used by government to develop SME by:

- Improving tax environment for SME by tax reform and modernization of tax administration

- Adopting taxation incentive policy to resolve bottleneck problem faced by SME (Yaobin, 2007)

Shahroodi, (2010) believes that in order for a tax system to be efficient, the tax policy needs to be designed as such that the tax rates would be appropriate and rational, the exemptions would become lower in amount, the tax collection organization would be more efficient, the tax burden of the indigent people should be lighter and the fight against corruption and tax evasion should be much more intense. Tax policy can be divided in three dimensions as incentives, rates, and administration on SMEs.

In sum, these findings lead us to hypothesize that

H1: Tax incentives have direct relationship with SMEs growth

H2: Tax rates have a direct relationship with SMEs growth

H3: Facilitating taxation bureaucracy increases SMEs growth

## 2.3 financial policies

Financial barriers, which affect SMEs, include the high cost of credit, relatively high bank charges and fees, high collateral requirements, and a lack of outside equity and venture capital. Often, domestic banks are orientated to provide loans to insolvent large enterprises. Information asymmetries between lenders and borrowers make it hard for banks to determine the real value of a project, and lead to credit rationing (Barlett & Bukvic).

As Francesca Pissarides (1998) said "credit constraints constitute one of the main obstacles to growth of SMEs". The availability of finance is one of the most controversial issues in the analysis of SME problems. Some authors maintain that insufficient finance is not a fundamental obstacle to SME growth and that firms with good projects will always find sources of finance (Bratkowski, et al. 2000). Banks and financial institutions have had to learn about working with SMEs and find methods for evaluating loan applications from companies with little or no track records. Furthermore, it is a general belief that SMEs have limited access to capital markets, either nationally or internationally, in part because of the perception of higher risk, informational barriers and the involvement in smaller projects, etc. As a result, SMEs have quite often been unable to obtain long-term finance in the form of term debt and equity, and a larger part of their investments have traditionally been self-financed. (Nam and Radulescu, 2007). Hereupon we can put forward the following hypotheses:

H4: interest rate of bank loan has direct relationship with SME growth

H5: facilitating credit and loan borrowing has direct effect on SMEs growth

H6: reducing cost of credit has direct effect on SME growth

## 3. The Methodology

The study had been undertaken in two phases. First phase was designed to identify the factors affecting growth in Ardabil. Thus, a list of 26 questions about tax, tariffs and governmental policy was screened out in the first stage. These questions were then sent to two identified groups for comments. The two identified groups were: academic researchers and government officers. Members of the two groups were asked to rate each of the 26 questions in terms of relatedness to SME growth, on a 5-point Likert scale ranging from "extremely important" to "extremely unimportant". After a careful screening analysis and advice from academic professionals, 21 of the 26 items were selected. These 21 items were regarded as the influential factors in SMEs growth in Ardabil.

The sample chosen in this study included SMEs CEO. The sample of 64 CEOs was drawn mainly from a list of 211 SMEs CEO from a statistical databank used in the first phase of the study. The firms were selected from Ardabil province, and were located in nine cities.

The final questionnaire for this study included two main sections. The first section of the questionnaire consisted of SMEs characteristics. The second part was obtained/elicited from the first phase with 21 items about factors affecting growth in Ardabil region.

This phase of the study used a questionnaire mailed to a random sample, designed to obtain a range of information on the growth of the firms, the government aids, the development of relations with national and international markets, the main developmental elements of the firm and its skills, and their impact on growth of interventions made by public authorities. In addition to this basic information, we decided to examine the growth phenomenon in more depth in order to discuss the variables identified and include others related to the personality of the entrepreneur and the environmental factors favorable or unfavorable to growth. To do this, we used the case study method, which ensured, first, that the right person was answering the questions and that we could react to his or her questions by providing additional details, and second, that a certain number of open questions were asked in order to obtain unexpected information in the course of the interview.

The first section of questionnaire contained questions to be answered by management alone, concerning factual elements such as the number and type of employees, location, the type of products and services offered, the technologies used, and so on. In all, there were a total of 35 relatively closed and detailed questions, including five ordinals.

Exploratory factor analysis with VARIMAX rotation was used to identify factor dimensions. Only those with

eigenvalues higher than 1.0 was considered (Kaiser, 1958, 1974) and factor loadings of .50 were utilized for item inclusion.

#### 4. Results

The aggregate of these four factors represent four dimensions of SME growth contributors in Ardabil. For each construct, the item responses were averaged to create a composite measure (except for the factor on productivity, which portrays internal effect of SMEs, consisting of one item only).

Altogether these four factors represented four dimensions of contributors to SME growth in Ardabil. For each construct, the item responses were averaged to create a composite measure (except for the factor on productivity, which portrays internal effect of SMEs, consisting of one item only).

The first factor was designated as bank loaning, due to the structure of its elements. The factor included items which were related to receiving loan and its proportion to the enterprise size. The second factor was the rate of credits profit. It was directly related to the amount of profit paid for loan, and its proportion to enterprise growth, it could justify over 18% of variance changes. The third factor denoted tax exemptions and discounts, and was called the propriety of tax exemptions and discounts. As a matter of fact, among the items which directly addressed exemptions, only a few ones were placed inside this factor, which had nothing to do with the amount of exemption and discounts, rather they reflected the proportion of these exemptions and discounts to growth. Finally, the fourth factor with four items justified totally 9% of the variance. This factor because of its characteristics was denominated as research and development incentives.

**Table 1** Results of the factor analysis (N = 64)

	Factor 1	Factor 2	Factor 3	Factor 4
Reduction of rate of offered facilities along with investment increase	.550			
The conformity of the bank facilities' rules to enterprise growth	.782			
The proportion of length of credit pay off to enterprise growth	.747			
facilitating the process of offering credit facilities by banks	.616			
The rate of credit profit paid to the banks		.694		
Bank discounts on rate of offered facilities in proportion to enterprise growth		.778		
Tax exemptions in the case of increasing the personnel number			.682	

Tax exemptions on imports and supply of articles and necessary primary materials			.565	
Discounts on tax in the case of investment in production			.728	
tax exemptions on products' exports			.866	
The extent of financial help of government for supporting staff training				.583
discounts on tax for supporting investments in research and development				.712
Final price of products compared to similar enterprises' products price				.648
tax exemptions on reconstruction of units				.606
Eigenvalue	4.504	3.711	3.584	2.902
% of Variance explained	21.248	18.810	16.169	9.070
Cronbach's Alpha	.901	.853	.760	.862
The Bartlett's test of sphericity (significance level)				.000
The Kaiser-Meyer-Olkin measure of sampling adequacy				.544

Note: 1) "productivity" variable was loaded into Factor 5 alone and thus was not selected as an independent factor with only one single item. (2) Items with a factor loading of higher than .50 are shown. Extraction method: principal component analysis. Rotation method: Varimax with Kaiser Normalization.

The fifth identified factor was profitability. As there was only one item related to it, the factor was excluded from the list of elicited factors and its degree of variance which was 3.405% was subtracted from total variance.

After, identifying the factors affecting enterprise growth from the respondents' perception, growth factors were calculated separately (Table 2). As table 2 displays, mean and standard deviation of growth indicators included number of sale, personnel, variety of products and activity background

**Table 2** Characteristics of SME s growth index

	Mean	Sd
amount of sale	127	13.164
number of staff	5	5.018
variety of products	3	1.260
activity background	5	1.422

To examine the effects of these factors on growth, the correlation coefficients of these two variables were calculated. Table 3 indicates the calculated correlation coefficients among the growth indicators and the obtained factors.

Subsequently, correlation analysis was employed to examine the relationship between four independent

factors and SME growth. The values of independent variables were calculated by multiplying the perceived importance of each variable (as depicted in Table 3) and the value of the factors obtained by averaging the values of each variable elements. The results of regression analysis are summarized in Table 3.

**Table 3** Correlations of SMEs growth and governmental financial rules

	F1	F2	F3	F4
amount of sale	.163 (.000)**	.071 (.128)	.316 (.000)**	.293 (.000)**
number of staff	-.204 (.000)**	.254 (.000)**	.084 (.000)**	.132 (.004)**
variety of products	.256 (.000)**	.054 (.442)	.285 (.000)**	.347 (.212)
activity background	.111 (.000)**	-.180 (.000)**	.488 (.000)**	.156 (.000)**
<i>Adj.R<sup>2</sup></i>	0.36	0.42	0.46	0.49

Note: \*\* Correlation is significant at the 0.01 level

\* Correlation is significant at the 0.05 level

We find that sales and variety of products show a positive and highly significant correlation with the obtained factors. Another words, third and fourth factors are positively correlated with many aspects of SME's growth. These factors are tax exemptions and R&D incentives.

Among the factors, only the fourth factor (R&D) was statistically significant in all the sectors, and had a positive effect on every aspect of growth. It is likely this relationship could confirm the generalizability of the effect of the relationship existing between R&D on the growth of an enterprise including SME.

In contrast, bank loaning had negative influence on the personnel/staff number. The rate of credits, as the second factor, showed negative influence on SME's age. It can indicate that unfair rates of credits can decrease SME's life and their growth cycle.

It is worth mentioning that the amount of sale had direct relationship with all the four factors, while the number of staff/personnel didn't enjoy direct relationship with the first factor, i.e., bank loaning. It is probable that not only the offering loan doesn't result in real and further employment, but also lead to resorting to unreal occupation for achieving the loan. The variety of products had relationship with each of the four factors, as well. It can reflect the more financial and investigational support was, the higher the amount of sale and the variety of products could be. However, the negative relationship between rate of profit and activity background catches the attention. The relationship discovered might be justified by the role of innovation in SMEs according to the Hoffman et al.'s (1998) study.

## 5. Conclusion

This study contributes to the literature on SME's growth by complementing empirical evidence on the financial and tax policy factors that affect SME's growth. In

contrast to previous research our analysis not only focused on differences between factors and SMEs but also provided evidence on the ways through which financial and tax policies affect SMEs growth indexes. Furthermore, this study, to best of our knowledge was the first study that analyzed double interaction between factors and growth indexes in a government-based economy like Iran.

For the empirical analysis, we used a large sample of SMEs over the period 2011-2012 from Ardabil province located in the northwest of Iran. This sample included over 64 SMEs. In the first step, a questionnaire was sent to CEOs of selected SMEs. Then, in the second step, we analyzed how/which variables were more effective on SMEs growth. Factor analysis showed four factors that explained more than 65% of total variance.

Thereby, we focused on these factors and the growth measures: sales, personnel number, the variety of products and age.

We found that R&D incentives and discounts' propriety with growth were the major determinants of the SMEs growth, and had significant relation with all the growth indexes.

The results obtained from factor analysis manifested the direct relationship between the rate of offered credits to SMEs and their growth. However, the key point was not the lowness of the rates, but it was the proportion of the rates to growth which mattered and had also significant relationships with goal indexes. Differently, the effect of rates of credits on the number of staff revealed negative relationship. These finding needs to be investigated in the future studies.

On the contrary, the proportion of the factors of research and development incentives, as well as tax discounts and exemptions from governments to enterprise growth were identified as the key elements which showed significant relationships with all the

dimensions of the growth. It can be claimed that both factors in the Iran's government-based economy result in sharper distinction between the enterprise and its rivals and its longer lifetime and further growth. On the other hand, both factors lend hand to financial power of enterprises. This investment cycle in research and development, and consequently, taking up a larger market portion increase success and growth of the enterprise. The strong relationship among financial discounts, exemptions, the amount of sale and activity background can support the ....?

The strong relationship between variety of the products and sale and research and development incentives also can be explained with the same reason.

Finally, we showed in the present study that financial support of the government can be helpful in the growth of SMEs, only in the case that there is programming in specific frameworks. In addition establishing the policies, such as further occupation through loaning or discount on bank profit, may not be obtainable in the current Iran's government-based economy.

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## Diagnosis and Surgical Management of Popliteal Venous Aneurysms: Report of Two Cases

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**Abstract: Objective:** The objective of this study was to explore methods for the diagnosis and treatment of popliteal venous aneurysms. **Methods:** We retrospectively analyzed the diagnostic and treatment processes used for 2 patients with popliteal venous aneurysms. The main symptoms in these 2 patients were pain and local swelling; pulmonary embolism (PE) was not found in these patients. Both the patients were treated using tangential aneurysmectomy with lateral venorrhaphy, followed by warfarin anticoagulation therapy for at least 1 year. **Results:** Both the patients recovered well with good popliteal vein shapes after surgery, as shown by angiography. No thrombosis-related complications were found until 1 year and 3 months after surgical intervention. **Conclusion:** Surgical resection should be performed as soon as possible after the diagnosis of popliteal venous aneurysm. Patients should be administered postoperative anticoagulation therapy to prevent thrombosis that may result from the potential risk of PE.

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**Keywords:** Popliteal venous aneurysm; pulmonary embolism; anticoagulation; surgery; resection

### 1. Introduction

Popliteal venous aneurysm is extremely rare and has no precise definition. McDevitt believed that vein aneurysm is a local expansion of the vein and defined it as a condition in which the vein diameter is more than 2 times the normal vein diameter [1,2]. Popliteal venous aneurysm is a common form of venous aneurysm. Only about 160 cases of popliteal venous aneurysm have been reported worldwide since the first report in 1968 by May and Nissel [3]. We reviewed the data on the clinical management of 2 patients with popliteal venous aneurysms who were treated at our hospital between 2010 and 2011, and analyzed the diagnostic and treatment details.

### 2. Clinical Materials

#### Case 1

A 29-year-old man with a mass in the left popliteal fossa for 5 months was admitted to our hospital. On examination, a soft mass (size, 5 cm × 7 cm) was found superior to the left popliteal fossa; the mass showed mild tenderness, which was relieved when the affected limb was elevated. No swelling or hyperpigmentation was observed in the lower left limb. The arterial pulse rate was normal. The circumference of the left limb at the region superior to the patella was 10 cm, which was 2 cm larger than that of the right limb. Deep vein angiography revealed a localized popliteal vein aneurysm

Color Doppler ultrasonography showed communication between the aneurysm and the superficial femoral and popliteal veins (Figure 1). No thrombus was found within the veins. Magnetic

resonance imaging (MRI) revealed a cystic mass within the soft tissue behind the left distal femur (Figure 2). Further, contrast-enhanced MRI revealed an enhanced blood vessel shadow at the edges of the lesions in the superficial femoral vein and popliteal vein. On the basis of these findings, we highly suspected the presence of a large venous malformation. The venous aneurysmal mass removed during the surgery was gourd-shaped (Figure 3) and 10 cm × 8 cm × 8 cm in size. The aneurysm was closely linked with the sciatic nerve; therefore, the mass was removed after the sciatic nerve was carefully separated from the mass. Many large- and small-sized branched venous openings were observed within the mass, but none of them showed a mural thrombus. The thickness and toughness of the wall of the mass were almost identical with that of a normal vein wall; therefore, we decided to perform tangential aneurysmectomy with lateral venorrhaphy. A 10.0 cm × 3.5-cm area of wall of the mass was removed, and the vascular wall of the mass was continuously sutured using 5-0 Prolene sutures. After surgical intervention, low molecular weight heparin (5000 U; twice daily for 3 days) was administered subcutaneously for anticoagulation; this was followed by oral administration of warfarin sodium tablet (5 mg per day). Low molecular weight heparin administration was discontinued when the international standard ratio (INR) was adjusted to 2~3, and balloon pressure treatment was performed to promote venous return; the patient was recommended to wear anti-thrombosis socks after being discharged

from the hospital. The patient was prescribed oral warfarin for 1 year. Intravenous angiography revealed good blood flow and popliteal vein form 1 year after surgery (Figure 4). A literature review confirmed that vein aneurysm of our patient was the largest reported to date; the largest diameter reported earlier was only 6 cm.

### Case 2

A 36-year-old woman complained of pain in the right leg for 1 year, and 10 days before being admitted to our hospital, she was found to have a popliteal fossa mass in the right limb. Examination of the right popliteal fossa showed a soft walnut-sized mass, with no tenderness, clear boundary, no local swelling and ulcers, normal arterial pulse rate at all levels, and normal peripheral blood supply. Deep vein angiography showed a mass shadow at the right popliteal vein (Figure 5). MRI of the right popliteal fossa showed a cystic mass behind the femur; this finding suggested that the patient had a popliteal venous aneurysm. During surgical operation, we first isolated the popliteal vein showing a partially eccentric expanding mass; the lesion was about 4.0 cm × 3.5 cm × 3 cm in size and linked closely with the tibial nerve (Figure 6). The popliteal vein and the tibial nerve were separated carefully, and a blocked belt was used at both ends of the popliteal venous aneurysm; after right lower limb exsanguination, a pneumatic tourniquet was used and the mass was removed. Many side ~vein openings that resembled the structure of a honeycomb were found within the mass. The aneurysm wall was partially thick and hard, and the trunk of the popliteal venous aneurysm was unobstructed. Part of the blood vessel with the expanding mass was removed, and the vascular wall was continuously sutured using 5-0 Prolene sutures; the balloon tourniquet was then released, and the incision was closed after careful homeostasis. Postoperative balloon pressure treatment was administered for 14 days, and low molecular weight heparin (5000 U; twice daily for 3 days) was injected subcutaneously; this was followed by oral administration of warfarin sodium tablets to adjust the INR to 2~3. Six months after surgery, deep vein angiography showed normal popliteal vein diameter, smooth wall, and venous blood flow (Figure 7).

### 3. Discussion

The cause of popliteal vein aneurysm is not clear. It may be related to congenital vascular malformation, trauma, inflammation, and vascular degeneration [4]. Microscopic examination of the popliteal venous aneurysm wall shows degeneration of inner cells and absence of elastic fibers and smooth muscle cells. Therefore, congenital factors coupled with mechanical

force may be the cause of most popliteal venous aneurysms.

Popliteal venous aneurysms can lead to serious complications, such as deep vein thrombosis and recurrent pulmonary embolism, or even death; however, aneurysm rupture has not yet been reported. Popliteal venous aneurysm could be saccular and fusiform, and the cystic aneurysm relatively easily forms a vortex and generates local thrombosis [5]. In this study, the aneurysm in the first case was gourd-shaped (with 2 spindles) and that in the second case was cystic. About 70% to 80% of patients with popliteal vein aneurysms have pulmonary embolism, and in the others, the aneurysms manifest as a popliteal fossa mass or chronic venous function insufficiency [7]. Deep vein thrombosis and pulmonary embolism or other complications were not observed in our patients. Ultrasonography is the preferred diagnostic method for detecting popliteal venous aneurysms, and it can be used to clearly determine the size of the mass and of the thrombus within the mass. Venography may be a more sensitive technique for determining the type and size of the mass. Magnetic resonance venography (MRV) or computed tomographic venography (CTV) can be used for further examination and can explain the anatomical relationship between the mass and its surrounding tissues.

Treatment options differ according to the mass size of popliteal venous aneurysms; patients with smaller aneurysms (diameter less than 2 cm) have low risk of thrombosis, and anticoagulation therapy with periodical follow-up by using color-ultrasonography may be effective. However, despite the administration of anticoagulant therapy, 80% of the patients with large popliteal vein aneurysms developed pulmonary embolism. For example, 2 patients with popliteal venous aneurysms who were administered only a simple anticoagulant therapy after surgery had fatal pulmonary embolisms [6]. Therefore, surgery is the best treatment choice for patients with large cystic popliteal venous aneurysms, particularly patients with a thrombus in the vessel with the aneurysm. The surgery is aimed at removing the thrombus within the mass, restoring normal blood vessel status, and preventing blood clot regeneration. Surgical methods may include tangential aneurysmectomy with lateral venorrhaphy, complete removal of the mass and end-to-end anastomosis, mass resection and bypass surgery, and mass resection and patch angioplasty with vein ligation [6]. Of these methods, tangential aneurysmectomy with lateral venorrhaphy is the most commonly used surgical procedure for treating popliteal venous aneurysms.

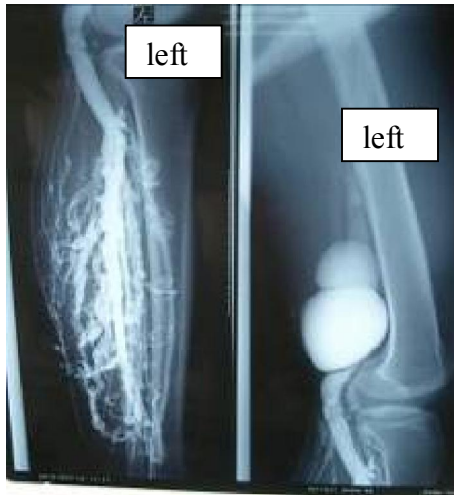


Fig. 1 Gourd-shaped popliteal venous aneurysm, as shown by angiography



Fig. 4 The popliteal vein is patent and in good shape



Fig. 2 Magnetic resonance imaging of the first case of popliteal venous aneurysm



Fig. 5 Popliteal vein patency, as seen on plain radiography

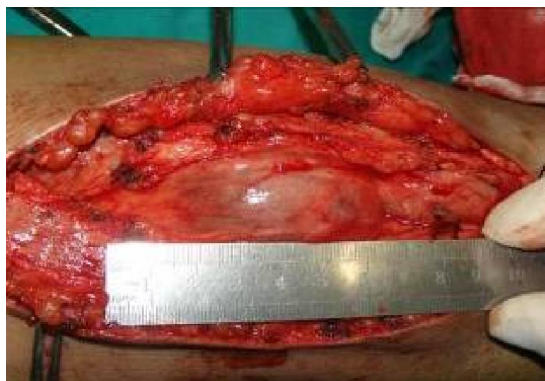


Fig. 3 Popliteal venous aneurysm of size 10 cm × 8 cm × 8 cm. A literature review revealed that the venous aneurysm treated at our hospital was the largest reported to date.



Fig. 6 The cyst-shaped popliteal venous aneurysm



Fig. 7 The popliteal vein showing normal shape; the scale shows the inner diameter

Tangential aneurysmectomy with lateral venorrhaphy was chosen for the 2 patients in our study, mainly because the walls of the venous aneurysms in these patients were thick; the structure of the aneurysm wall was similar to that of a normal vein; the venous pressure was low; and vein expansion was generally not easy to restore. We observed numerous vein branch openings in the wall of the venous aneurysm, and these branch openings need to be ligated if the mass wall is to be removed. If all vein branches in the mass wall are ligated, it may cause venous system reflux disorder of the lower extremity and cause long-term swelling.

Blocking only the proximal and distal ends of the mass is not enough to restrict blood flow; pneumatic tourniquets may also be required. When partial resection of the mass and unilateral suturing are not successfully completed, or in patients with a high risk of partial mass re-expansion after the removal of the fusiform aneurysm wall, mass resection with end-to-end anastomosis may be performed; however, surgeons should ensure that there is no tension in the vessel during this procedure.

Mass resection and bypass surgical procedures can be used when the vein wall is thin, because of which anastomosis cannot be performed, or when the tumor cavity is filled with blood clots. The veins preferred for bypass are autologous veins, such as the great saphenous vein, small saphenous vein, and internal jugular vein. If a normal vein diameter cannot be maintained after partial removal of the aneurysm wall, mass resection and patch angioplasty may be performed for the above-mentioned veins. If the small saphenous vein entrance is occupied by the popliteal vein aneurysm, the vein can be easily cut and

Diagnosis and surgical management of popliteal venous aneurysms patches can be made from it to reinforce the anastomosis after mass removal [7]. Vein ligation is not generally performed, because it can cause long-term venous reflux disorders after ligation. Irrespective of the surgical procedure chosen, postoperative anticoagulant therapy is critical for maintaining long-term popliteal vein reflux after popliteal vein reconstruction. To this end, we recommend oral administration of warfarin for a minimum of 1 year. Further, the use of a pressure pump for preventing postoperative venous thrombosis or anti-thrombosis elastic stockings may help during recovery.

#### 4. Conclusion

Popliteal venous aneurysms are very rare and can cause a potential risk of pulmonary embolism; therefore, popliteal venous aneurysm should be considered when there is unexplained pulmonary embolism. Ultrasonography is the preferred method and venography is the gold standard for diagnosing popliteal venous aneurysms. For popliteal venous aneurysm patients with non-clinical manifestation of the pulmonary embolism, surgical resection of the mass should be performed as early as possible after diagnosis; tangential aneurysmectomy with lateral venorrhaphy is the most common surgical approach. Long-term anticoagulation therapy after surgery is necessary for such patients.

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## Investigating the Intermediate Role of Achievement Goals among Personality Traits and Educational Self-Handicapping Among University Students

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**Abstract:** In order to investigate the role of achievement goals among personality traits and educational self-handicapping, 382 university students were selected using the multi-stage cluster sampling and answered questions including subscales of achievement goals, personality traits, and educational self-handicapping. The results of the path analysis showed that euroticism has an indirect and negative influence on educational self-handicapping through mediating chievement goals. Moreover, the intermediate role of extroversion on educational self-handicapping was not proved. Evidence shows that setting these goals is directed by various events and leads to different patterns of cognitive, emotional, and behavioral outcomes.

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**Keywords:** achievement goals, personality traits, educational self-handicapping, different patterns

### Introduction

Self-handicapping is referred to as any kind of activity or practice which enables the individual to attribute failure to an external factor (as an excuse) and success to an internal one (to achieve pride) (Burglass and Jones, 1978). Based on these strategies, students consider failure as the result of some external factors and do not try to improve their performance. In this study, we try to describe the use of self-handicapping strategies based on the theories of achievement goal and personality traits. Being in a social-cognitive perspective of motivation, the theory of achievement goals focuses on how learners interpret their achievements (Shank et al, 2008). Three achievement goals commonly investigated include mastery goals, approach-performance goals, and avoidance performance goals. Students who are mastery oriented emphasize on developing proficiency in one topic. On the other hand, students with performance goals wish to demonstrate their competencies to others. More precisely, students with high performance-approach desires tend to show that they are more competent than their peers, while students with high avoidance performance goals seek to avoid social judgments declaring that they are less competent than their peers.

Evidence shows that setting these goals is directed by various events and leads to different patterns of cognitive, emotional, and behavioral outcomes (Eliot,1999, Shank et al, 2008).

Studies investigating events leading to achievement goals focused on the role of personality traits (De, Radosevich, & Chasteen, 2003; Zweig, & Webster, 2000) and the school and classroom atmosphere (Aimes, 1992, Arden, 2004, Walters,2004). Outcomes of achievement goals are

referred to as self-effectiveness, self-motivated learning, positive emotions, high interest, and positive attitude towards assignments (Aimes, 1992, Eliot, 1999, Kaplan et al, 2000, Walters et al, 1996), self-handicapping (Eliot and Church, 2003; Eliot, Cury, Fryer, & Huguet, 2006; Midegly and Arden, 2001; Amundsen, 2004).

Personality traits have been investigated in different studies as outcomes of achievement goals (Komarraju, & Karau, 2005; Samani et al, 2008; Khoamraee and Khayer, 2006). One of the most influential personality theories is the Five Factor Model (FFM) (Goldberge, 1992; Wiggins and Pincus, 1992). Five main factors of personality include extroversion vs. introversion, agreeableness vs. antagonism, conscientiousness vs. lack of direction, neuroticism vs. emotional stability, openness to experiences vs. closeness to experiences.

Neurotic people tend to be anxious, moody, and vulnerable to depression (Howard and Howard, 1998). Investigations show that so far, no research has studied the relationships among these variables in a causative model especially in the educational context of Payam-e-Noor University which has a different educational structure from the traditional educational system. Therefore, the present study aims at investigating the relationships among these variables from a different and new perspective. Moreover, studies showed that there is not considerable amount of theoretical and research evidence exploring the direct influence of personality traits on educational self-actualization. Therefore, given the relationship between personality traits and achievement goals on the one hand, and the relationship between achievement goals and educational self-handicapping on the other, the purpose of the present study is to

explore the intermediate role of achievement goals between personality traits and educational self-handicapping (Graph 1). (Figure 1).

### Methodology

This is a descriptive correlative study (nonexperimental). The population consisted of all Payame-Noor University students in the Fray Province in different majors (N=620000). Using the multistage cluster sampling and based on the Krejcie and Morgan Formula, 382 students (245 females and 137 males) were selected. Data gathering instruments: data were gathered using a questionnaire made up of Jones and Rhodewalt self-handicapping (1982), Middleton and

Midgely achievement goals (1997) and the Goldberge Five Factor Model (1999) subscales. The Cronbach's alpha coefficients for educational self-handicapping, mastery goals, and approach-performance, avoidance performance, and personality traits were 0.79, 0.80, 0.71, 0.74, 0.77, respectively.

### Findings:

In this study, data analysis was performed using the path analysis. Table 1 presents indirect influences of personality traits on educational self-handicapping. (Table 1).

As table 1 shows, the indirect influence of extroversion on educational self-handicapping is 0.01 and not statistically significant. The indirect influence of openness to experience is -0.08 which is significant at 0.01 (given  $t=-3.57$ ). Since the influence of openness to experiences on approach-performance goals is insignificant (shown in table 2), it is concluded that this indirect influence is only exerted through mastery and avoidance-performance goals. The indirect influence of agreeableness on educational self-handicapping is -0.07 and given  $t = -2.70$ , it is significant at 0.01. Given the insignificant influence of agreeableness on mastery goals (shown in table 2), it is concluded that this indirect influence is exerted only through approach performance and avoidance-performance goals. The indirect influence of task-involvement on educational self-handicapping is -0.12, which, given  $t=-4.95$ , is significant at 0.01. Since this indirect influence is exerted by all three aspects of achievement goals, it could be concluded that achievement goals play an intermediate role between task-involvement and educational self-handicapping. The indirect influence of neuroticism on educational self-handicapping is 0.07, which, given  $t=3.22$ , is significant at 0.01. Given the insignificant influence of neuroticism on performance-approach (shown in table 2), it is concluded that this indirect influence is only exerted through mastery and avoidance-performance goals.

Below, graph 2 (the fit graph of predicting educational self-handicapping) with fit properties are presented. (Figure 2).

### Discussion and conclusion

Findings indicated that the proposed model has a good fit with the data. In this model, 24% of the variance of educational self-handicapping was explained by personality traits and achievement goals. Although the indirect influence of extroversion on educational self-handicapping was not supported, the results demonstrated that other personality traits influence educational self-handicapping through mediating in achievement goals in a positive or negative way. Based on the findings, openness to experiences has a negative and indirect influence on educational self-handicapping through mastery and avoidance-performance goals. Therefore, students with wisdom, openness to new ideas, cultural interests, educational attitudes and creativity tend to set mastery goals and insist on developing learning and skills. They don't study to escape criticisms and avoid creating obstacles in the way to their success. Moreover indirect and negative influence of agreeableness on educational self-handicapping through approach-performance and avoidance-performance was proved. Given this fact, students with optimistic approaches and adaptability flexibility toward life events often avoid setting avoidance-performance goals and set approach performance ones and therefore, attribute their failures to wrong goal-setting and try to address their shortcomings to improve their chances of success. Regarding the fact that performance-approach goals sometimes have positive outcomes and sometimes produce negative ones, Midgely, Kaplan, and Middleton (2001) believe that approach-performance goals are influenced by the nature of learning output, personality traits, and environment. So, this paradox could be the result of using different instruments, age groups, and educational environments (quoted in Mohsenpoor, 2005). The indirect influence of task involvement on educational self-handicapping was significant and performed through all three aspects of achievement goals. Therefore, students who are task involved, efficient, organized, and responsible always set mastery goals and avoid approach-performance and avoidance-performance goals, which reduces the possibility of adopting educational self-handicapping strategy.

Finally, the indirect influence of neuroticism on educational self-handicapping was positive and performed through mastery and avoidance performance goals. Therefore, students who with negative emotions such as anger, depression, anxiety, etc. tend to set avoidance-performance goals and avoid mastery goals, which increases the possibility of adopting educational self-handicapping strategies.

Regarding the fit model in this study, some studies also supported the relationships between

personality traits and achievement goals (De, Radosevich and Chasteen, 2003; Zweig and Webster, 200; Samani et al, 2009; Khormae and Khayer, 2007), and the relationships between achievement goals and educational self-handicapping (Eliot and Church, 2003, Eliot, Cury, Fryer, and Huguet, 2006, Midgley and Arden, 2001, Amundsen, 2004).

Therefore, the intermediate role of achievement goals between personality traits and educational self-handicapping among Payam-e-Noor University students, which is the main finding of this study, is in line with previous literature on this issue. On this basis, it is proposed that the planners and managers of Payam-e-Noor University provide a suitable and pleasant cultural and scientific environment and, in this way, facilitate forming positive traits such as agreeableness, task-involvement, and openness to experiences in learners. Obviously, these conditions provide appropriate context for accepting mastery goals and avoiding performance-avoidance goals and reducing the use of educational self-handicapping among students.

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10/30/2012

**Customer Relationship Management (CRM) and Study of Its Effect on Competitive Advantage**Seyed Karim Mousavy<sup>1</sup>, Bahman Saeedian Rad<sup>1</sup>, Mohsen Bujarpor<sup>1</sup>, Behzad Mashali<sup>1</sup><sup>1</sup> Department of Human Resource, University of Science and Culture, Tehran, Iran  
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**Abstract:** The purpose of this paper is to provide a managerially useful, end-to-end view dimension of the CRM process in organizations from a marketing point of view. Find solution for providing relation with customers in market and organizations specially those which are more dependent on information and knowledge since it is a critical element for them that determine their success. This perspective taken is customer based not the company's. We are going to find that how much the CRM could have effects on industrial competitive advantages to gain the above-average return for companies.

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**Keywords:** Customer; Management; Competitive

**1. Introduction**

Customer Relationship Management (CRM) is the process of gathering, collecting and analyzing a firm's data and information as regards customer tions so as to improve value of the customers in existence firm. Firms exploit necessary information by designing strategies specially targeted to consumer needs. This process enhances loyalty for both customers and firms, increases switching costs, as information from consumer preferences to leads an enduring competitive advantage. By integrating and matching different data (such as operations, service logs, etc.), choice researchers can obtain and make a more complete and suitable view of customer behaviors. There is difference between Analytical CRM and behavioral CRM. Analytical CRM consists of using customers' information on firm to design long period models of choice through the sky of the firm's products and using them to expand the market revenues from its customers through their lifecycle. In this world high-technology and globe with rapid innovation, open markets and high-model competition nowadays some things remain unchanged as past that one of them is the customer is still king and firms to get successful strategy should be customer oriented.

Customer Relationship Management (CRM) has become a wealthy popular strategy in recent years for its hypotheses on the belief that collecting data and expanding the relationship with customers can be the best way to serve customer's loyalty and subsequent profits.

Obtaining, evaluating and clustering successful and unsuccessful adopters of CRM technology.

Quantitative (survey) will be used as the basis of this analysis.

This study is focusing on analysis of relation between firm and its customers to help firm to get advantage in market competitions and develop the strong market strategies to achieve the market leadership. In other words, what do the managers in firms need to know about their customers and how the information could be used to develop a complete CRM perspective?

What would be a normal frame and style of a successful CRM Process for a firm?

**Research Objectives**

There are some main areas in this study that will have critical effects on Building a successful Customer Relationship Management (CRM):

1. Creating a comprehensive database of customer activities.
2. Analyze, Test and Process data from database to get suitable information.
3. Achieving correct and processed information to make decisions for obtaining firm's target via which groups of customers.
4. Identify the ways to build advantage relationships with the targeted customers.
5. Identify metrics to evaluate the success of the CRM process.

**Justification of study**

The Main purpose and goal of this study is to represent a true and helpful scenario by using the part of researchers, scientist, markets CEO last powerful experiences, statistical and achievements for firm's managers who are going to establish the new market, web base markets, e-trading and marketing or even them who are doing business for long term traditionally and ignore one of the most important chain in new business strategies, CRM and its process effects on getting market advantage.



Using an integrated system, try to find ways to build a durable strong relationship and be in touch with customer who could be a big powerful tool for firms and managements to achieve huge revenue via identifying targeted customers and their main favorites are just some part of our limited study in CRM that has a good potential to growth in fertilized industry area. Hence, this paper could be a notation for industrial firms to be concerned about firms and CRM process style that could vary in different firms.

### Literature Review

Generally Customer Relationship Management (CRM) is the process of gathering, collecting and analyzing a firm's data and information concerning customers' interactions in order to enhance value of the customers in existing firm.

This brings about a growing realization that CRM is an approach that allows governments, firms' owner and managers in industries to dramatically develop their relationships with their customers through reorganizing service delivery capabilities around customer intentions.

The key concepts that constitute an integrated approach to CRM enable agencies to create an informed, integrated view of their customers and use this information to design and coordinate the delivery of services through multiple channels. CRM can thus be described as providing management with a set of tools and techniques that enable intelligent interactions.

Paul Crook, Andrew Simmonds and Stephen J. Rohleder (2003) as a researcher group in an exploratory research presented. They present a model of customer base Data gathering (Figure 1).

The process of CRM could be different from firm to firm. There are varieties of CRM aspect that we represent few of them in this study which are common.

Russell S. Winer (2001); Companies are recognizing that creating databases and getting

creative in collecting customers' information is one of the most important and useful tools in firms and it has a powerful impact on industry.

Ben Pinkerton (2004); If segmentation-type analyses through are performed and elaborately accomplished on purchasing or related behavior, the first customers that would normally be selected are most probably those in the most desired segments.

Targeting selected customers by means of more convenient approaches is initiated by performing a portfolio of direct marketing methods such as telemarketing, direct mail, questionnaire forms, and when the nature of the product is suitable, using direct sales.

Tim R. Coltman (2004); the goal of relationship programs is delivering a higher level of customer satisfaction than competing firms can deliver.

Research has shown that there is a strong, positive relationship between customer satisfaction and profits.

Satisfactory levels must constantly be measured by managers and pre-conceived subsequent programs are initiated that help to deliver performance beyond targeted customer expectations.

Tim R. Coltman (2004); believes that in CRM world, increased emphasis is being placed on developing measures that are customer-oriented and give the managers a better idea adaptability of CRM policies and how programs are working.

Costs of customer acquisition, Conversion rates (from lookers to buyers), Retention/churn rates, Same customer sales rates, Loyalty measures, Customer share or share of requirements are satisfactorily accomplished as being pre-programmed.

All of these measures imply the followings

A: doing a better job

B: acquiring and processing internal data

C: making sure how the company is proceeding at the customer level.



Figure 1. Model of customer base data gathering.

### Theoretical Framework

Companies are recognizing that one of the useful tools in firms leading to a powerful impact on industry is creating databases and getting creative at collecting customers' information. Nowadays Real-time analyses of customer behaviors in e-commerce world (such as Internet, Web sites, e-shop, etc. ) to gain better customer selection and make it as a market target is already here which and whatever customers are likely to purchase is easily anticipated.

This study is in base of a model which will just illustrates a small part of CRM vast area as a standard framework.

1- Creating a Customer Database; is first step in a complete CRM process which is construction of customer database or information files. Which is a foundation for any customer relationship management rule? In Web-based businesses, it should be a fairly straightforward task as the customer transaction and contact information is gathered as a natural part of the customer's interaction.

For companies not having collected enough customer information, the task will involve seeking historical customer contact data from firm's internal sources such as accounting and customer service.

What should be collected for the database ideally contains information about the following:

2- Transactions: it consist a complete purchase history with any details attached.

3- Customer contacts: by passing each day the number of customer contact issues is going increasingly via market channels and communication parts. It is not ideal to be limited on company sales calls center or customer service department, but any company initialed contact is welcome.

4- Descriptive information: is for separating data to different parts and doing the process of data analyzing. The data should also be over time;

A lot of companies have traditionally used a various methods to build their databases. Durable goods manufacturers use information from warranty cards for basic descriptive information. Unfortunately, response rates to warranty cards are in the 20-30% range lead big gaps in the databases. Service businesses are normally in better situation because the nature of the product involves the kind of customer-company interaction that naturally leads to better data collection. For example, banks have been a premier industry of CRM activities for a number of years. Telecom-related industries (long distance, wireless, cable services) similarly have a large amount of customer information.

5- Analyzing the Data; one traditional way in customer database analyzing is via defining customer segments. Some various statistical methods ranging

such as cluster and discriminate analysis have been used to group customers with having common behavioral patterns and descriptive data which are then used to develop different product offerings or direct marketing campaigns. Direct marketers have used such techniques for long periods. They want to make most profitable far reaching perspective as a target for catalogue mailings and to enhance catalogues to different groups.

Recently, such segmentation reasons are too criticized. Gathering a large number of customers and forming groups or segments assumes a marketing effort towards an average customer in the group. Further, there is an increasing in attention to understand each row of the database, that is, each customer and what he or she can contribute to the company in terms of profits.

As a result, recently lifetime customer value (LCV) is introduced into the marketers as a determining factor. In this study the idea is that each row/customer of the database should be analyzed based on current and future profitability to the firm. Once a profit figure is assigned to a certain customer, the marketing manager can then decide which customers to target.

6- Customer Selection; after the customer information construction and analysis in the database, the next step is to consider which kind of customers should be targeted with the firm's marketing programs. The analysis results could be of various types. If segmentation-type analyses are performed on the amount and size of their purchase, the first customers that would normally be selected are those in the most favorite segments (e.g. highest purchasing rates, greatest brand loyalty). Other segments could also be chosen that depend on other factors.

For example, if the customers in the heaviest purchasing segment already purchase at a rate that implies further purchasing is unlikely, a second tier with more potential would also be attractive. The other variables for these segments (e.g., age, industry type) provide information for spread the marketing tools. In addition, these variables could be matched with present commercial databases of names to find additional customers matching the profiles of those chosen from the database.

If individual customer-based profitability is also available through LCV or similar analysis, it would seem to be a simple task to determine on which customers to focus.

The marketing manager can use a number of criteria such as simply choosing those customers that are profitable (or projected to be) or imposing an ROI hurdle. The goal is to decide which customer is profitable to separate customers that will provide the most long-term profits from those that are currently

decreasing profits. This allows the manager to separate customers who are too costly to serve relative to the revenues being produced.

7- Targeting the Customers; the target selected customers, a common approach is to include a portfolio of direct marketing methods such as telemarketing, direct mail, questioners forms, and when the nature of the product is suitable, using direct sales. Researchers such as Peppers and Rogers (2005) have insisted that companies begin to dialogue with their customers through these targeted approaches not by talking at customers with mass media.

8- Relationship Programs; the goal of relationship programs is to show a higher level of customer satisfaction than competing firms can deliver. There has been a large volume of research in this area. From this research, managers today are certain that customers match realizations and expectations of product performance, and that it is critical for them to deliver such performance at higher and higher levels as expectations increase because of competition, marketing communications, and changing customer needs. In addition, research has proved that there is a strong, positive relationship between customer satisfaction and the more profits. Thus, managers must constantly consider satisfaction levels and suggest programs to help deliver performance above targeted customer expectations.

A comprehensive set of relationship programs is shown at the figure 2:

**Customer service:** service given to customers  
**frequency/loyalty programs:** programs to increase mutual loyalty

**Customization:** Establishing favorite customer in customers

**Rewards programs:** Giving rewards for their affiliation

**Community building:** seem to be a simple task to determine on which customers to focus.

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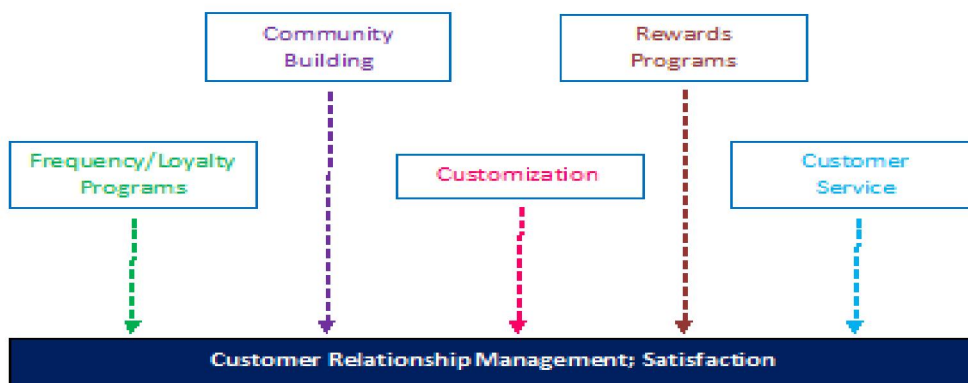


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### Community building

Privacy Issues; A database of customer information and activities, are all depended upon CRM system described in this article. In other words, these are the subsequent follow up. There is an obvious tradeoff between the ability of companies to better deliver customized products and services and the amount of information necessary to enable this delivery. Specially, because of ever-increasing use of the Internet, many consumers and advocacy groups are concerned about the amount of personal

information existing in databases and the way they are being used.

Metrics; the reason why so much attention is that old methods by traditional metrics used managers to measure the success of their products and services in the marketplace are almost abandoned. Financial and market-based indicators like profitability, market share, and profit margins have been and will continue to be important. But in the world of CRM, increased emphasis is being placed on evolving measures that are customer-oriented and give the managers a better idea of how their CRM policies and programs are working.

Some of these CRM-based measures, both Web and non-Web based are the following:

a; Costs of customer acquisition

b; Conversion rates (from lookers to buyers)

c; Retention/churn rates

d; Same customer sales rates

e; Loyalty measures

f; Customer share or share of requirements (the share of a customer's purchases in a category devoted to a brand).

All of these measures imply doing a better job acquiring and processing internal data to focus on how the company is performing at the customer level (Figure 3).

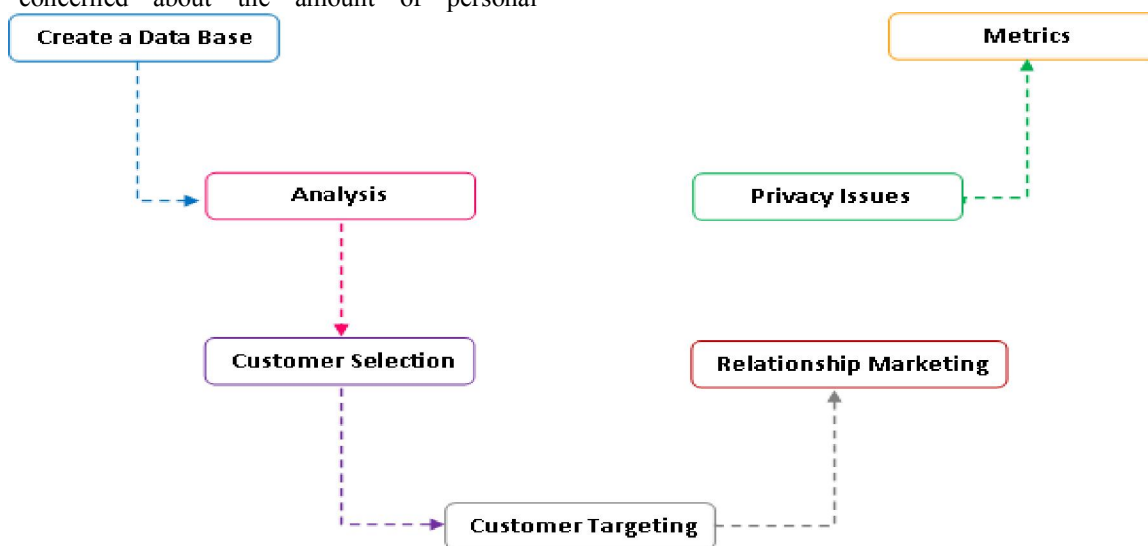


Figure 3: How the company is performing at the customer level

### Research Methodology

The nature of this study is hypotheses testing and we conduct the tests according to them, there are four hypothesis existing. This study aim to examine if certain feature of a CRM process may cause certain result which in this case is integration and it make the type of investigation a causal one.

The study setting is field study which is done by conducting a questionnaire. Since results are gained all according to firm responsibilities and customer interactions, the researcher interference is minimal.

The study is mainly based on questionnaire to examine the capability of CRM on both customer and firm interactions. Then it has been attempted to

explore effectiveness of CRM Building which will led to integration at the end. In previous researches different characteristics of CRM Area have been discussed, this study just use a different approach since the result which is focused on is market portfolio. The locus of the study is mainly based on European companies and for making the research more applicable we have considered ten big companies which are worth-noted.

The questionnaire is based on customer responses. In other word, the unit of analysis of this paper is customers who have most effect on process of CRM building and translating these effects to the firm via manager's actions. In this case the smaller groups are in priorities because in such situations firms have more interaction with customers and more understanding of customer's characteristic are gained. The time horizon of the study is also longitude; all data are collected during periods and by considering current condition of target companies.

In order to gaining valid result which could be generalized to some extent to all firms in Europe, this study is conducted between different firms which are representative of different type of organization and since they all have a common feature they have been chosen. They are all big and it means they all need to divide firm's domain into small tasks and make a number of divisions and make them in charge of small tasks.

The following are illustrations of some corporate database-building efforts:

A worldwide customer database from 50 "Legacy was created by company 3Com databases scattered throughout international application. They built customer records from e-mails, direct mail, telemarketing, and other customer contacts, with descriptive information by department, division, and location.

A new kind of analysis originating from the Internet is click-stream analysis. In this kind of data analysis, patterns of mouse "clicks" are examined from cyber store visits and purchases in order to better understand and predict customer behavior. The aim is to see how rapidly can we convert the rates, the percentage of browsing customers to actual buyers.

All the division in the firm should be accessible to every one so that we can use the related customers. In fact we ask at least one group in each division (such as Design Part) and we try to achieve the minimal sample size for each division it means that if a company has more divisions compared to others the result gained from it would be greater in number. We try to use same sample size for similar divisions in different companies for simplifying the process of analyzing the gathered data.

AT&T offers different levels of customer service. They all depend upon a customer's profitability in their long-distance telephone business. For highly profitable customers, they offer "hot towel," personalized service. For less profitable customers, you get automated, menu-driven service.

The wireless provider Page Net raised monthly rates for unprofitable subscribers.

**Clearly, the intent was to drive them away.**

Similarly, Federal Express raised shipping rates for residential customers in expensive-to-serve areas where their volume did not justify normal rates. The point is that without understanding customer profitability, these kinds of decisions cannot be made.

The instrument for conducting this research is questionnaire and some observations should be done for assessing the validity of the results gained from the customers and firms' responses to questions. The results would be analyzed using computer based software or SPSS.

Some results would be in form of qualitative and we try to measure them according to firms' responses and most questions are in form of rating and ranking. There are mainly close ended questions which facilitate the analysis but there are still some open ended questions for in dept comprehension in the field study.

The main measurements are done via questionnaire and respondents are customers who evaluate their firms (market).

This study examines the CRM procedures characteristics according to Liker scale and Fixed or Constant Sum Scale.

For measuring CRM effectiveness and successfully qualification we also use observations along with questionnaire in case of dominance and confidentiality. For some sensitive questions there is a need for confirming through observation. Although all variables could be evaluated to some extent by observation but dominance of the CRM design and role or existence of substitutes and neutralizers need more consideration.

### **Conclusion of this paper**

Despite the troubled picture of customer management, it offers hope and a way forward for companies working to improve their Customer Management performance. Don't flush the baby out with the bathwater – the concepts that excited people in the past still hold; finding the right customers, keeping and developing them by providing them with a great customer experience – even more so in this increasingly fragmented, multi-channel world.

The research which is detailed in this document shows three key things:

Customer Management is worth the investment – companies experienced in Customer.

- Management perform better in business than less competent companies
- Managing the implementation approach carefully is vital

A focus on building emotional loyalty with customers via positive brand experiences does reap significant financial rewards.

### Conclusion

In today's complex business world, a company must ensure it has the right systems in place for managing customers. Customer retention and customer loyalty are important goals for successful companies. Good customer management enables companies to ensure that the services they provide are in line with what the customers want, which in turn help realize the above-mentioned goals. Importantly, it can also identify further opportunities for growth. The following conclusions can be drawn from the present study:

Companies with successful customer management can expect to report better performance than companies with less competent customer management.

It is vital to manage the implementation approach very carefully.

A well chosen customer management process with a focus on building emotional loyalty through positive Brand experiences will result in a growth in business profits and revenue.

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## Coastline Change Detection using Remote Sensing and GIS at TONEKABON Coast Area during 1984 and 2010, MAZANDARAN PROVINCE, IRAN

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**Abstract:** The coast is a special place on which Atmosphere, Hydrosphere and Lithosphere are in contact to each other. Coastline is one of the most important linear features on the Earth's surface showing a dynamic nature. The coast and its environmental management need information on coastline and its changes. Regarding to the sea level changes in the recent century, the coastline changes issue has introduced more consideration of social, economical and environmental aspects at Tonekabon coastal area, and has created some problem for the environment and residential areas. In this study, the common approaches for determination of coastline changes through Remote Sensing (RS) and Geographical Information System (GIS) techniques and also Satellite Images has been applied on Tonekabon coastline. The TM, ETM and ETM+ landsat satellite images in 1984, 2000 and 2010 were selected, and their geometric and radiometric error correction were done at pre-processing stage. At image processing stage, Band #5 being the best band of detecting water from land, and contrast enhancement, Thresholding and edge detecting filter as the best separation approaches were applied. Outputs in the form of raster layers, showed a zigzag-like coastline from 1984 to 2000 and 2010. Afterwards, raster data were converted into vector, and position changes of coastline for 41 points with an equal space of 1000 m were measured. Results showed an average displacement of 75.2 m toward coast during 1984 and 2000. The average change, during 2000 and 2010, was determined 32.9 m. In these years, most of the study area has encountered a retrograde water level and expansion of land and only in a few places small values of rising in sea level has been observed. In order to evaluate the accuracy of the applied methods in extraction of coastline and its change measurement, field measurement was also taken that Building destruction by sea waves, sinking several buildings under water, protecting of buildings against sea expansion and so on, are some witness for the methodology accuracy of this study in the coastline changes issue at Tonekabon City.

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**Keywords:** coastline change; TM and ETM+ sensors; spatial detection; Tonekabon City.

### 1. INTRODUCTION

The coastal areas are always physically and ecologically changing that depends to natural and human factors. Natural factors of coastline changes are evaluated through three methods: short term changes including the effects of increasing and decreasing of flow; long term changes including climate variation, temporal storms and waves; and random changes including natural unexpected events (Tağil and Cürebal, 2005; Krueger, et al, 2008). These happened changes would affect on coastline changes and coastal areas, and in future would negatively affect on human and human activities and sea communications (Bayram, et al., 2004; Tai-Wen, et al., 2007).

Monitoring of coastal areas is an important fact in steady development and environment maintenance. To monitor a coastal area, coastline extraction in various times is an essential task

(Alesheikh, et al., 2007). Coastline is one of the most important linear features on the Earth's surface showing a dynamic nature (Winarso, et al., 2001). Coastlines are introduced as one of the most important geographical features on the Earth's surface by International Geographical Data Committee (IGDC), geographically are the intersection of coastal area and the sea water (Kurt, et al, 2010). Accordingly, it is important to produce coastline map and to determine the changes for a secure shipping, resource management, environment maintenance, planning and coastal steady development (Di, et al., 2004).

Literature review of so far done researches related to the monitoring of coastline change could be explained as following: from 1807 to 1927, all coastline maps were produced through field measurements. In 1927, real potential of aerial photos to complete the coastline maps was understood.

During 1927 to 1980, aerial photos were considered as the most especial for producing those maps. However, too many photos needed to produce a regional coastline map, and being expensive and too much time taking of gathering, correcting, analyzing and transferring the data and also being white and black photos are considered as their limitations (Lillesand, et al., 2004). Beside these limitations, not being digital photos, having low temporal coverage and low geometric accuracy could also be mentioned. Progressing the evolution of the researches related to the changes of coastline monitoring, satellite image and remote sensing techniques and Geospatial Information system were entered and applied on this field of study having more accuracy, vast spatial and temporal coverage and accurate and understandable outputs and so on. Remote sensing and Geospatial Information System have economically an important role on acquiring spatial data (Alesheikh, et al., 2003). Optical satellite images are easy to acquire and interpret. Furthermore, Infra Red wave length absorption by water and the ability of vegetation and soil in their intensive reflection, have converted these images to an ideal combination for producing the spatial map of land and water distribution. These characteristics of water, vegetation and soil has prepared the ability of applying images containing visible and IR bands to produce coastline maps (DeWitt, et al., 2002). Of new studies done related to this issue could be mentioned such as determination of coastline change using Remote Sensing (Alesheikh, et al., 2007); Coastline changes at Istanbul during 1987 and 2007 (Kurt, et al., 2010); and Coastline change and sea level rising along Bhitarkanika coast: analytical point of view of Remote Sensing and Statistical techniques (Chand and Acharya, 2010).

During the past decades, Tonekabon coastal area has encountered considerable changes of coastline indebted to the Caspian Sea's waves and rapidly getting industrialized and urbanized. Regarding to the fact of sea level changes in the last century, coastline changes in this area has introduced more consideration to the social, economical and environmental aspects, and has brought along some environmental and residential problems in Tonekabon coastal area. Thus, in this study we have tried to apply the common determination methods of coastline changes using Remote Sensing and Geospatial Information System techniques and also TM and ETM+ satellite images at Tonekabon City during 1984 to 2010, and to analyze and assess the coastline changes of the study area.

## 2. THE STUDY AREA

Tonekabon City with an area of about 2114 km<sup>2</sup> lies in 51° 17' to 51° 31' eastern longitudes and 36° 15' to 36° 52' northern latitude (figure 1). From north, Tonekabon City is restricted to the Caspian Lake, the biggest lake of the world, from south to the Alborz Mountains and Qazvin Province, from east to Challos City and from west to Ramsar City; the Chalk road is the border between these two cities. Northern parts of the city is surrounded by a narrow coastal plain which has a varying width of 1 to 9 km. Due to a relatively enormous amount of rainfall and surface and groundwater flows, the city has a dense vegetation. A plain part of the city is covered by forest which has been converted to farmlands of tea and rice and fruit gardens.

## 3. DATA AND METHODOLOGY

Remote sensing is one of the best and most reliable methods in monitoring and management of environment and resources (Doygun, et al., 2003; Maktav and Erbek, 2005; Duran, et al., 2006; Deng, et al., 2008; Karaburun and Demirci, 2009). Various methods have been created to extract coastline from satellite images. Since the reflection of water in IR bands are almost Zero and most of vegetation have a bigger reflection versus water, coastline can be extracted from even one band of the image. This extraction can be achieved from thresholding on one IR band of TM and ETM+ images. Thus, in this study we have used satellite images of TM, ETM and ETM+ Landsat in the years 1984 (Sep 19), 2000 (Jul 25) and 2011 (Aug 1) to monitor the coastline changes of Tonekabon City. Characteristics of spectral and temporal resolution index of various bands of these images are illustrated in table 1.

### 3.1 PRE-PROCESSING AND SATELLITE INTERPRETATION

Selection of an appropriate spatial and temporal image is an essential step to investigate any changes, and consequently to analyze them. Landsat satellite image with a spatial resolution of 30 m and IRS with a resolution of 22.5 and 5 m, are some of the best and most important tools in investigation of coastline changes. Investigation of coastline changes of Tonekabon City in 1984, 2000 and 2011 was taken using Landsat satellite images. Applying pre-processing on these images, spatial and radiometric amplifying was done, and separately analyzing each band and also in combination with various bands, the best band or combination of bands were selected to detect and control the ground points. Afterwards, determining the checkpoints on images and topographic maps, image georeferencing and geometric correction were done.



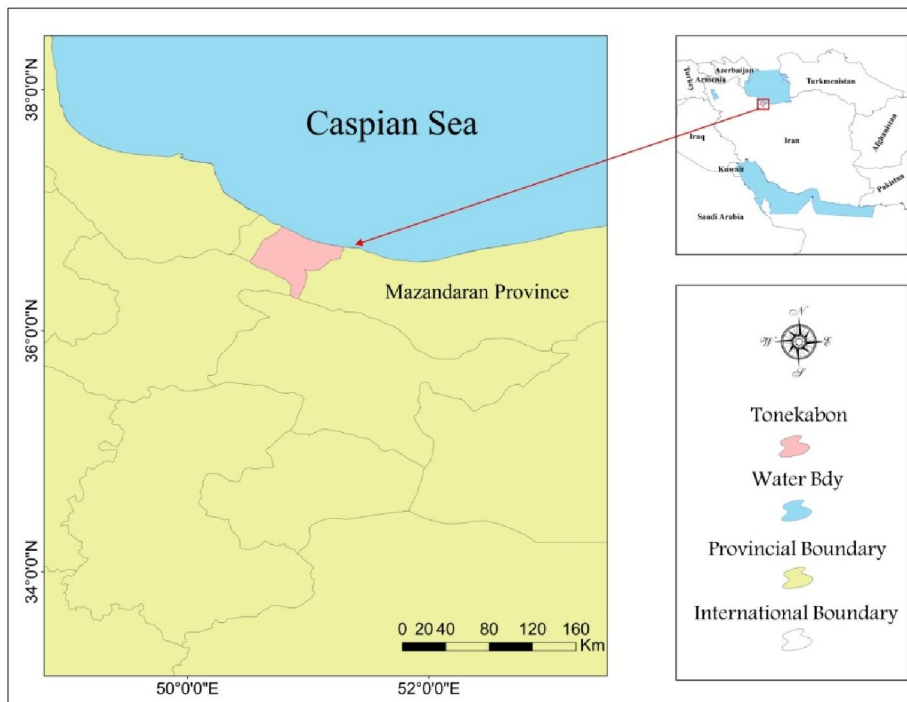


Fig 1. Geographical location of Tonekabon City

Table 1. Spectral and temporal resolution index of Landsat 7 (ETM+) and Landsat 5 (TM)

Band No.	Spectral range (Microns) ETM+/TM	Spatial resolution (m) ETM+/TM
1	.45 to .515 / .45 to .52	30
2	.525 to .60 / .52 to .60	30
3	.63 to .69 / .63 to .69	30
4	.75 to .90 / .76 to .90	30
5	1.55 to 1.75 / 1.55 to 1.75	30
6 (L/H)	10.4 to 12.5 / 10.5 to 12.4	60 / 120
7	2.09 to 2.35 / 2.08 to 2.35	30
Pan	.52 to 90 / Nil	15 / Nil

### 3.2 SATELLITE IMAGE PROCESSING AND WATER-LAND SEPARATION ALGORITHM

This step has an important effect on analyses, and needs the highest level of accuracy in determination of the best algorithm to separate and distinguish coastline in satellite images. Best spectrum of the electromagnetic waves for separation of water from land is IRS. IR wave's absorption by water and its large amount of reflection by vegetation and to some extent soil, create a strong contrast between water and land. Owning separate bands in visible and IR spectra, Landsat satellite images prepare good choices for users. By analysis of spatial profile in different bands of TM and ETM+, it can be concluded that in bands with visible wave length (bands 1, 2 and 3) and Thermal IR (band 6) there is no considerable difference between water and other features; but bands 5 and 7 have the most differences, and for further mono-band-based studies these bands

have been used. For this purpose, application of bands 5 and 7 has been recommended by several researches. After selection of appropriate bands, in order to separate land and water, various methods can be applied as follow:

Contrast enhancement; if limitation of gray steps is such varied that get expanded in all black and white axes, a situation would create that relative distribution of gray steps is constant and the contrast between dark and light areas would increase. Previous studies used various methods have showed that because there exists a complete amplitude of pixel's brightness (0-255), linear expansion of contrast would not have a considerable effect on crude images of bands 5 and 7; but saturated linear expansion of contrast with a saturation degree of 5 percent has been very effective on band 5 and has created a strong contrast between water and coast. Convenient resolution of images was not also

produced using contrast expansion with histogram justification method.

Spatial detection of images or filtering method; operation of detecting and separating some components of digitized images from other parts is called spatial detection of images or filtering. Applying overpass filter on image, high frequency information let us to isolate or amplify the local details (Richards and Jia, 1998). From all overpass filters of ERDAS software, filters of overpass and edge detection with 3\*3 have been used.

### 3.3 SELECTING THE WATER-LAND SEPARATION METHOD

Based on results from amplifying methods, contrast enhancement by saturated linear expansion method is more effective in image amplifying, and band 5 is also effective than band 7 in border separation; but since this method only covers the spectral amplifying, in order to extract a distinct border between water and land, it was used along other completing methods, one common of them is temporal amplifying. Thus, various filtering methods were used that edge detection filter on images of band 5 showed better results versus the others. Because the mentioned filter has less effect on existing features in image, extraction of water-land border and even the flat wet lands and water, especially for band 5, was more convenient. Flowchart of the steps applied on this study is illustrated in figure 2.

### 4. RESULTS

To determine the dominant coastal processes acted at certain places, analysis of former coastline data using their change values as a witness of dynamicity of coastline can be effective. In this paper, using temporal detection of band 5 of Landsat satellite images in 1984, 2000 and 2010, coastline changes of Tonekabon City were extracted. Figure 3 shows results of spatial amplifying of images by contrast enhancement method along with thresholding and edge detection filter to investigate the coastline changes of the study area. Based on this spatial amplifying, coastline of Tonekabon City during the study years, from nearly a straight linear form in 1984 has changed to a zigzag-sine form in 2000 and 2010 that the main factors are human activities and construction in the area. After amplifying, the obtained coastline from band 5 of Landsat images was converted to vector feature to measure its change values in different parts of the area. Several examples of the vectorized coastline movements in those three years have been showed in figure 4.

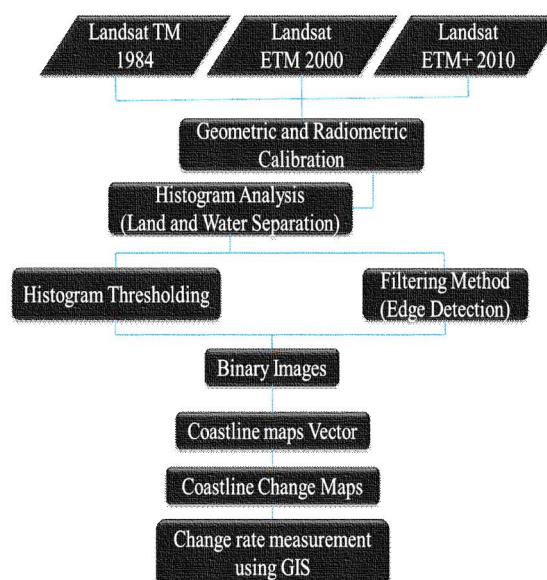


Fig 2. Methodology framework for determination of coastline change

Afterwards, to investigate and determine the spatial changes of coastline, spatial changes from images of 1984, 2000 and 2010 in 41 points with equal distances of 1000 m were measured; results are shown in table 2. Spatial changes of coastline in these 41 points are in such a way that from 1984 to 2000, the area has encountered a raise in sea level toward the land and a decrease of the area in all point, whereas from 2000 to 2010, the coast of city with a decrease in sea level has encountered an increase of area in most parts of the land, and only in distances of 3, 9, 14, 18 and 23 km, the sea has had an increase of the water level toward the land with an average of 15 m spatial change. Interview with natives of the area shows that decrease of sea level and increase of land has occurred 5 years ago.

According to table 2a, minimum and maximum values of spatial change of coastline during 1984 and 2000 are 20 and 204.7 m, respectively, lied in 1 and 6 km of measured coastal changes; average spatial coastline changes in these 16 years is 75.2 m with an annual average movement of 4.7 m of Tonekabon coastline. Based on table 2b, spatial changes of coastline during 2000 and 2010 has been lessened versus the former period, that minimum and maximum values of changes are 0 and 96.1, respectively, lied in distances of 7 and 4 km recorded from the measurement points. Average movement of coastline during these 10 years is about 32.9 m showing an annual coastline movement of 3.3 m in Tonekabon City. Diagram of spatial changes of coastline during the study years along the 41 measurement points is illustrated in figure 5.

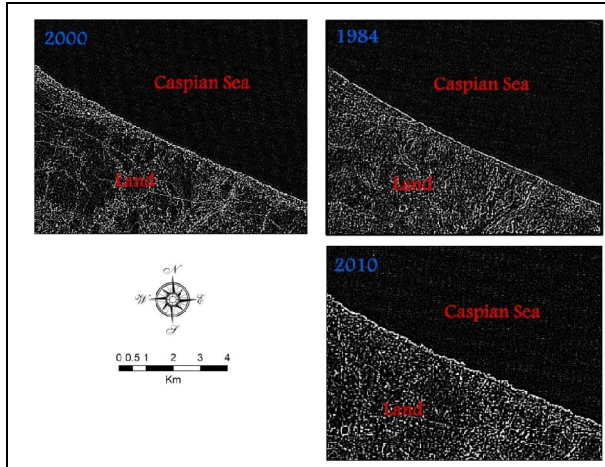


Fig 3. Land-water separation by spatial amplifying of band 5 of Landsat satellite image

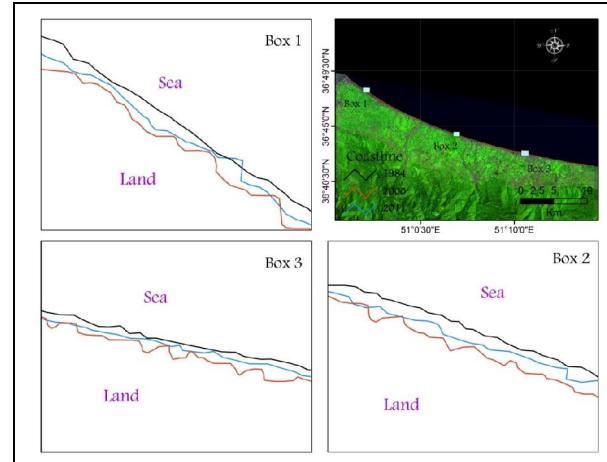


Fig 4. Spatial changes of coastline in Tonekabon City in 1984, 2000, 2010

Table 2a. Spatial movement values of coastline during 1984 and 2000

Distance	Changes (m)	Distance	Changes (m)	Distance	Changes (m)	Distance	Changes (m)
0	24.9	11000	75.9	21000	78.8	31000	83.3
1000	20	12000	114.5	22000	59.7	32000	85.1
2000	39.5	13000	90.4	23000	43.1	33000	31
3000	30.1	14000	45.1	24000	61.1	34000	30.4
4000	103	15000	76.7	25000	110.6	35000	21.3
5000	71.6	16000	82.3	26000	87.1	36000	25.8
6000	204.7	17000	83.8	27000	84.4	37000	63.9
7000	87.9	18000	65.7	28000	114.5	38000	97.8
8000	125.3	19000	111.7	29000	52	39000	82.9
9000	98.1	20000	82.1	30000	55.3	40000	76.8
10000	103.6	-	-	-	-	-	-

Table 2b. Spatial movement values of coastline during 2000 and 2010

Distance	Changes (m)	Distance	Changes (m)	Distance	Changes (m)	Distance	Changes (m)
0	18.06	11000	11.3	21000	36.1	31000	48.28
1000	11.23	12000	53.7	22000	31.6	32000	82
2000	12.56	13000	29.5	23000	12.7	33000	20.2
3000	11.3	14000	0.6	24000	51.8	34000	21.9
4000	96.14	15000	22.4	25000	54.9	35000	21.1
5000	22.1	16000	7.4	26000	12.8	36000	8.8
6000	57.1	17000	28.2	27000	48.7	37000	31.7
7000	0	18000	22.1	28000	90.7	38000	53.3
8000	21.7	19000	58.06	29000	17.95	39000	39.8
9000	29.3	20000	69.3	30000	24.7	40000	21.8
10000	38	-	-	-	-	-	-

**5. DISCUSSION AND CONCLUSION**

Assessment of accuracy values for the measurements of Tonekabon coastline changes by remote sensing and GIS techniques needs a comparison with the coastline extracted from band 5

of Landsat satellite images or field measurements. Therefore, field measurements in various points have proved the precision of used methods in this study, and will be discussed later. Figure 6 is an example of constructions done after revolution (around 1976) in

Sisaraa (east of Salmanshar). According to rules, at those years the sea limits were 60 m far from buildings, and review with natives shows that this limit had been maintained. Starting the sea advancement toward the coast, these buildings have been affected by the risk of sea waves and most of the have sunk under the water and got ruined. In later years, to protect the buildings, some structures were created that can be seen in figure 6 as concrete blocks.

Figure 7 is also another example of destroyed buildings in sea advancement that at the

moment its yard is under the water, and its planting and grass are related to before sea advancement. The location of this building is Asbchin coast that is shown is the Google Earth photo (figure 7).

Measurements of spatial movement of coastline show that during those three study years, from 1984 to 2000 and 2010, zigzagging of Tonekabon coastline has happened and the reason is mainly human activities. Figure 8 is another example of these activities that is also a reason of sea rollback at the construction site of Ghoo Hotel, Salmanshahr.

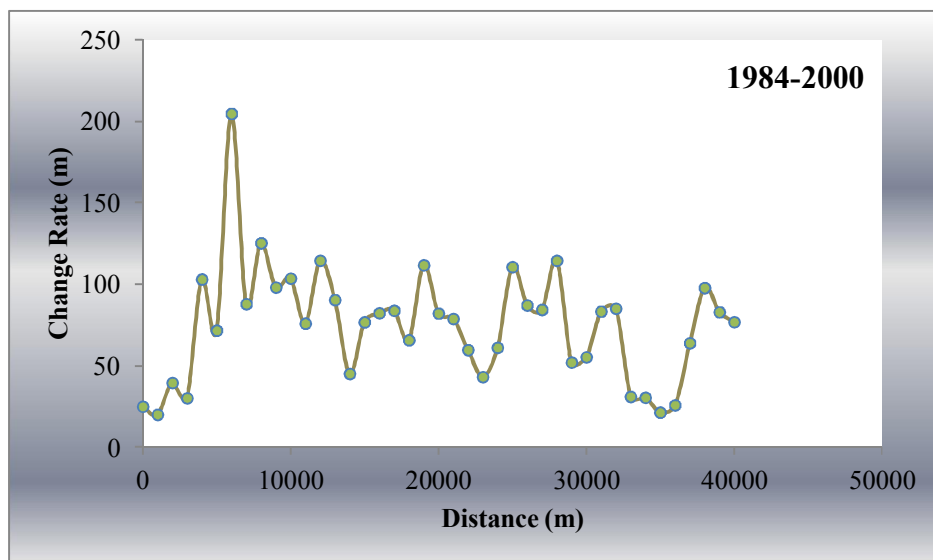


Fig 5a. Diagram showing the spatial changes of coastline during 1984 and 2000

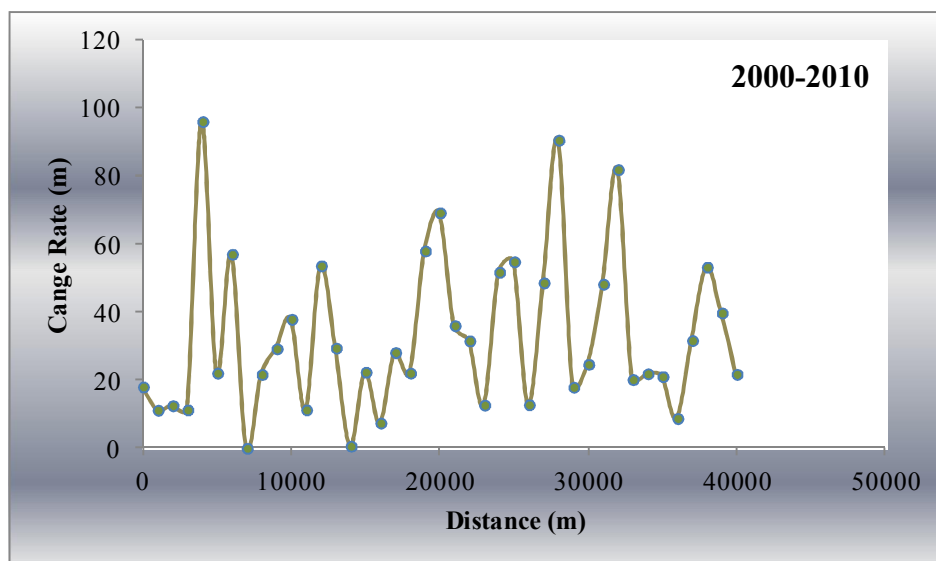


Fig 5b. Diagram showing the spatial changes of coastline during 2000 and 2010



Fig 6. Destroyed buildings in expose of sea waves in Sisaraa coast

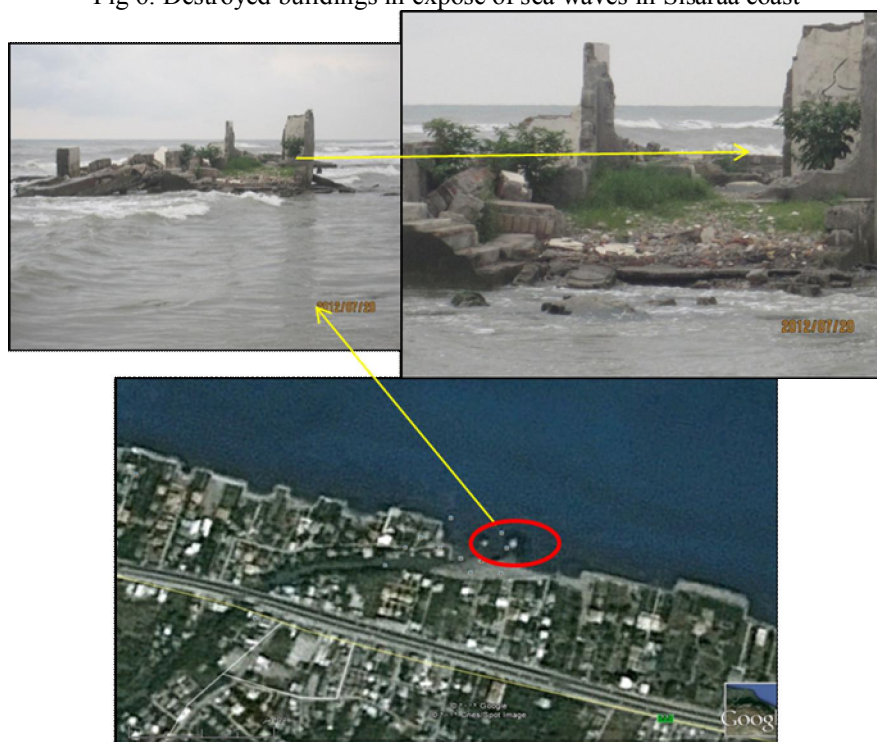


Fig 7. Sinking the building under the water in Asbchin coast because of sea advancement

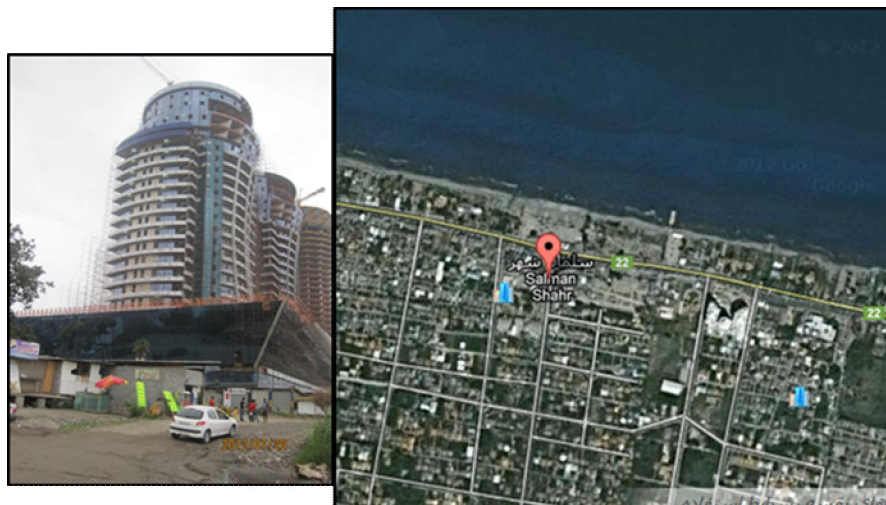


Fig 8. Human, a factor of zigzagging and rolling back of the sea (Ghoo Hotel, Salmanshahr)

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## A Comparative Study on the Amount of Self-Esteem and Aggression (Cognitive Features) of Students of Different Majors in Qaemshahr Humanities Faculty

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**Abstract:** In this study on the amount "self-esteem" and 'aggression' of boy and girl students in the education year 2011-2012 was studied. As the purpose of the study was to investigate and compare the rate of cognitive features of 'self-esteem' and aggression of girls and boys students of different majors of Qaemshahr Azad university faculty of humanities, to do the researcher used the descriptive method. The sampling included 343 students of 11 majors chosen randomly of a population of 3431. To access the needed data, two tests of self-esteem of "Cooper smith" and aggression, test of "Eysenck" were employed. In the present study the general hypothesis of "girl and boy students of different majors enjoy different levels of "self-esteem" and minor hypotheses of :1-students of different majors are different in the amount of "self-esteem". 2- Students of different majors are different as the rate of aggression is concerned and. 3- There is a meaningful difference in boys and girls as for as the rate of self-esteem is concerned. 4- there is a meaningful difference between boys and girls as for as "aggression" is concerned were studied. After a descriptive analysis of the gained data, the researcher found out that the greatest number of students is that of "Law students" with the frequency of 656, and the least number belongs to Educational Sciences students with the frequency of 112, while the biggest number of sample students belongs to law students with a frequency of 66 and the least number of the sample students chosen is that of educational sciences with the frequency of 11. The tables of data show that the greatest frequency of scores of "self-esteem" are respectively 27, 34 and 35. It shows the fact that "self-esteem" is relatively high and the biggest frequency of scores for "aggression" is respectively 33, 36 and 39, which indicates the fact that aggression is below average in the groups studied. The study also shows that the average of "self-esteem" scores is higher in girls than in boys, and the average of "aggression" is higher in boys than girls. The average of "self-esteem" scores in the students of Physical education, Law, English translation, Accounting, Banking and Custom Management are respectively higher than in other field students. It also shows that the average score for "aggression" in students is higher in the students of Agriculture Economic, Physical education, Accounting, and Administrative Management students, respectively, than in other fields of study students. Based on the inferential and deductive analysis, it was that there is not a significant and meaningful relationship between the fields of study in the dependant compound variables, that is self-esteem and aggression. (Partial Eta Squared = 0/059, Wilks Lambda = 0/88,  $P < 0/005$ ,  $F_{20/660} = 2/054$ ) The analysis of each of the dependant variables by itself using the "Ben Feroni's" alpha (0/025) shows that fields of study do not have that much effect on the dependant variables of self-esteem and aggression ( $F = 1/88$ ,  $P = 0/047$ ). But the groups were different in self-esteem just due to their fields of study, therefore, we can conclude that there is a meaningful difference between students of different fields of study as for as self-esteem is concerned, but there is not such a meaningful difference as for as aggression is concerned as a dependant variable, i.e., the independent variable of field of study is effective on the level of dependant variable of self-esteem, but it does not have such an effect on the level of aggression. Also, in the studied group, regarding the sex, there was not seen such a meaningful difference in the dependant variable of self-esteem. ( $p = 0/309$ ), but in the dependant variable of aggression there is a meaningful difference ( $p = 0/000$ ), it means that the independent variable of sex is determine in the level of dependant variable of aggression, but not on the level of dependant variable of self-esteem. Analyzing the Variance, the researcher found out that there is not any meaningful difference as far as level of self-esteem is concerned ( $F = 1/82$ ,  $df = 10$  &  $P > 0/005$ ). Therefore, the first hypothesis was refuted. Also, by analyzing the Variance, the researcher found out that there is a meaningful difference between the students of different fields as far as the level of aggression is concerned. ( $F = 2/874$ ,  $df = 10$  &  $P < 0.005$ ) thus the second hypothesis was confirmed. Also, by calculating the "t-test", it was found that there is not a meaningful difference between boys & girls as far as level of self-esteem level is concerned ( $P = 0/312$ ,  $df = 341$  &  $t = 1/013$ ), hence the third hypothesis is rejected. Calculating the "t-test" it was also found that there is a meaningful difference between boys & girls as far as the level of aggression is concerned. ( $P = 0/000$ ,  $df = 341$  &  $t = -6/426$ ), accordingly the fourth hypothesis was approved.

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**Keywords:** Self-esteem, aggression.

## 1. Introduction

One of the out-standing traits of successful people is enjoying self-confidence and self-esteem which are based in childhood and adolescence in the family environment and then school, social environments, friends, one the way person knows him/her self. Psychologists experiences have shown that man is naturally seeking for variety and gets bored with monotonous and stable environment, especially not-suitable emotional and mental conditions, paralyze him and his personality and makes him imbalanced.

In the past hundred years, many psychologists have admitted the theory that man needs self-esteem (Adler/1930, Allport / 1937, Rogers/ 1959 Sullivan /1953, Horny 1937, James /1890, Morphy / 1947, Rank /1959). The issue of self-esteem and self-value are of the most essential factors in the development and growth of man's personality. Enjoying a strong will and self-confidence, decision-making and innovatively, creativity, mental, health, all have a direct relationship with the amount of self-value. In other words, self-esteem is a basic factor in the relationship between us and life and has a certain effect on independence, efficiency and capability of ours. The way we count life depends on the sense of self-esteem and can change it from a positive and stable and optimistic to a negative, pessimistic and hesitant one. Aggressive behavior, on the other hand, both from a cognitive and from a behavioral aspect, has been an issue to psychologists. studies on abnormal behaviors show that behavioral problems in childhood and adolescence can relate to problem and crises of temporary, and can slow down and normally fade-away but emergence of some problems are introductory to some future problems.

In socialization of children, whether of adaptability on of its effect on society, no behavioral format can equal in importance as aggression and cruelty. Ignorance and short-coming in preventing aggressive behaviors can lead to negative and long-lasting effects (Rice / 1980). Studies show that managing children and adolescents with aggressive and behaviors could be successfully done and by employing modifying methods and behaviors one can save both the person and the society of the pain and discomfort. (Vix nelson, Israel, Allen -C- 1984) aggression has been so popular in the man's life that he has considered it as natural, and the first scientific researches on the issue date less than a century.

## 2. Material and Methods

As the purpose of the study was to investigate and compare the amount of cognitive

features (self-esteem and aggression) of boy and girl students of Qaemshahr Islamic Azad of university, we can call the kind of the study as descriptive Comparative. Population is all the students of humanities faculty of Qaemshahr Azad university in (2011- 2012) education year (3431). Sampling according to krijisi and Morgan (1970) table was done. 343 students in 11 majors (Educational sciences, Family studies, Physical Education, Islamic education, English translation, Administrative Management, Accounting, Persian Literature, Law, Agriculture Economics, Banking and Custom Management), all randomly selected in both sexes.

To determine the level of 'self-esteem' of girl and boy students, Cooper Smith's test was applied, this test includes 58 yes-No question which scored 1 and 2. Also to determine levels of aggression 'Eysenck' test 'was applied. It included 30 items with never, hardly ever, some items-and always which scored 0,1,2,3 respectively.

## 3. Data-analysis

In analyzing the gained data, the researcher used descriptive statistic indexes and at the level of inferential statistics, multi-variables test, independent 't-test', and, variance analysis were used.

## 4. Results (findings)

General hypothesis: boys and girls students in different majors enjoy different levels of self-esteem and aggression. Analyzing data with the use of multi-variable test, the researcher did not notice any meaningful difference between the fields studied in dependant variables "self-esteem and aggression". (Partial Eta Squared = 0/059, Wilks Lambada = 0/88,  $P < 0/005$ ,  $F_{20/660} = 2/054$ ). The analysis of each of the dependant variables by itself using the "Ben Feroni's " alpha (0/025) shows that fields of study do not have that much effect on the dependant variables of self-esteem and aggression ( $F=1/88$ ,  $P=0/047$ ). But the groups were different in self-esteem just due to their fields of study, therefore, we can conclude that there is a meaningful difference between students of different fields of study as for as self-esteem is concerned, but there is not such a meaningful difference as for as aggression is concerned as a dependant variable, i.e, the independent variable of field of study is effective on the level of dependant variable of self-esteem, but it does not have such an effect on the level of aggression.

### First hypothesis:

Students of different majors are different as for as level of self-esteem is concerned. In analyzing the hypothesis, given the data gained through



computing variance analysis ( $p=0.055$ ,  $f=1.825$ ) it was found that there is not a significant difference in students of different majors regarding the self-esteem rate, hence, null hypothesis is confirmed with 95%, and it is nullified. Physical education students enjoyed the highest level of self-esteem  $M=34$  and economic students the lowest  $M=28$ , and the mean on the self-esteem was  $M=31.39$  for all majors.

#### **Second hypothesis:**

Students of different majors are different in enjoying the level of aggression. Analyzing this hypothesis and given the data gained through variance test analyzing ( $p=0.002$ ,  $f=2.874$ ) it was found that there is a significant difference in students of different majors as for as level of aggression is concerned, therefore, the hypothesis is confirmed by 95%. Economics students enjoyed highest level of aggression  $M=41$  and Islamic education students enjoyed the lowest level  $M=30$ , while the general mean was  $M=36.26$  for all majors.

#### **Third hypothesis:**

There is a significant difference in boys and girls as for as self-esteem is concerned. Statistical data and computing 't-test' it was found that there is no any significant difference between boys and girl self-esteem ( $p=0.312$ ,  $df=341$ ,  $t=1.013$ ) by 99% null hypothesis was confirmed and the study hypothesis was refused. Girl students mean was 32 /boys =  $M=31$ /girls enjoyed a higher mean, regarding the mean of self-esteem for all majors, there was not such a significant difference observed between boys and girls.

#### **Fourth hypothesis:**

There is a meaningful difference between the amount of aggression in boys and girls. Analyzing the hypothesis, given statistical data computed through 't-test' it was found that there is a significant difference of aggression between boy and girl students ( $p=0.000$ ,  $df=341$ ,  $t=-6.426$ ), accordingly the hypothesis was confirmed by 99%. Boy students  $M=39$ , girls  $M=33$ , boys of a higher level of aggression compared with the general mean of all majors  $M=36.26$  The difference of aggression in boys and girls is significant.

### **5. Discussion and conclusion:**

#### **Analyzing the general hypothesis:**

"Girl and boy students in different majors enjoy different levels of self-esteem and aggression". As based on data analysis and multi-variable test, there was not any meaningful difference between fields of study as compound dependant variables (self-esteem and aggression), therefore this

hypothesis is totally refuted. This hypothesis result does not agree with such Iranian researchers 'studies as 'Eshaghi, Gorgi (2000)'- Nazem Shirazi /Masoud Biabangard (1998)- Parsa, Mohammad (2003). It is not also in line with the result studies of other researchers such as: Store '1991', Sian '1985', Tanjeni '1990', Harder and Luis '1986', Krinis, Granman and Barclay (1989).

#### **First hypothesis analysis:**

"Students of different majors are different in self-esteem levels" Analyzing the hypothesis /given the statistical data computed through variance analysis /it was found that there is not any significant difference between students of different majors /hence / the null hypothesis was confirmed by 95% and the study hypothesis was refuted. The findings of the first hypothesis are in agreement with such Iranian researchers as, Biabangard ismael 1991, Eshaghi Gorgi, Hasan 2000, Nazem-Shirazi Masoud 1998 and Also, hafman and others 1988, Cooper smith 1970, Rosenberg 1965, Bachman 1970, Stang 1972, Vinota 1989.

#### **Second hypothesis analysis:**

Students of different majors are different in the level of aggression ". Analyzing the hypothesis, given the statistical data computed through variance analysis, it was found that there is a significant difference between students of different majors as for as level of aggression is concerned, hence the hypothesis of the study is confirmed by 95%. The conclusion of the second hypothesis is in agreement. With those of such researchers as, Navabi neg had, shokuh 1996, karimi Yosef 2007, Watson, and Bandura. There is a significant difference of self-esteem in boys and girls, thus null hypothesis is confirmed by 99% and that of the study is refuted.

#### **Third hypothesis analysis:**

In agreement with the studies of such researchers as, Malak-Kheili, Ali 1992, Yori, Mohammad 1992, Esmaeelneghad, Mehri 1995.

#### **Fourth hypothesis analysis:**

Between boys and girls /there is a significant difference of aggression" As the statistical data gained through computing, t-test, show /there is a significant difference between girls and boys in aggression. Thus /the hypothesis of the study is confirmed by 99%. The result of this hypothesis is in agreement with those of such researchers as: Hamdzade Sadati /Seyede fatemeh 1996, Gazi Mir Saad/Seyede Narges 1997, Gorzodin, Nematollah 1993 /Karimi yusef 1989, Lwin Stein 1985, Darsky & Jones 1987 /Rosenberg 1989.

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**Intelligent Fault Detection of Ball-bearings Using Artificial neural networks and Support-Vector Machine**

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**Abstract:** Due to the importance of rolling bearings as one of the most commonly used industrial machinery elements, it is necessary to develop proper monitoring and fault diagnosis procedure to suppress malfunctioning and failure of these elements during operation. For rolling bearing fault detection, it is expected that a desired time domain analysis method has good computational efficiency. The interesting point of this investigation is the introduction of an in such systems through extracting features in time effective method for fault detection and diagnosis in such systems through extracting features in time domain from vibration signals, artificial neural networks (ANNs) and support vector machines (SMVs) that used for classification of rolling-element bearing faults. The extracted features from original and preprocessed signals are used as inputs to the classifiers for two-class (normal or fault) recognition. The classifier parameters This features are classified successfully using SVM and ANN classifier, The classifiers are trained with a subset of the experimental data for known machine conditions and are tested using the remaining set of data. The procedure is illustrated using the experimental vibration data of a rotating machine. The roles of different vibration signals and signal preprocessing techniques are investigated The performance of SVM have been found to be substantially better than ANN with the entire feature set.

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**Intelligent Fault Detection of Ball-bearings Using Artificial neural networks and Support-Vector Machine.**

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**Keywords:** Fault diagnosis; Roller bearing; feature extraction; SVM; ANN

### 1. Introduction

Roller bearings are the important and frequently encountered components in the rotating machines that find widespread industrial applications. Therefore, fault diagnosis of the roller bearings has been the subject of extensive research. Rolling bearing faults can have many reasons, e.g. wrong design, improper mounting, acid corrosion, bad lubrication and plastic deformation [1, 2]. The process of roller bearing fault diagnosis includes the acquisition of information, extraction of features and recognition of conditions. The latter two have priority to the first one. Different methods are used for the acquisition of information; they may be broadly, classified as vibration and acoustic measurements, temperature measurements and wear debris analysis. Among these, vibration measurements are commonly used in the condition monitoring and diagnostics of the rotating machinery [3]. The vibration measurement of the roller bearing can be made using some accelerating sensors that are placed on the bearing house. When faults occur in the roller bearing, the vibration signal of the roller bearing would be different from the signal under the normal condition [4, 5, 6]. So far, many conventional vibration-signal-analysis-based methods have been applied to rotating machine fault diagnosis. Quite a few works have been done in this field, e.g. by Wang and McFadden [7], Shiroishi et al.

[8], Scholkopf [9], Dellomo [10], Li et al. [11], Jack and Nandi [12], Nikolaou and Antoniadis [13], Samanta et al. [14], Al-Ghamd and Mba [15], and Purushotham et al. [16]. The possibilities of using support vector machines (SVMs) in machine condition monitoring applications are being considered only in recent years. For example, Nandi [17], and then, Jack and Nandi [18] have provided a procedure for condition monitoring of rolling element bearing. Then they improved their work by using GAs for automatic feature selection in machine condition monitoring [12, 19-20]. Samanta et al. developed a procedure similar to that of Jack and Nandi but different in processing time-domain signal [14], where only two cases were studied which are false and normal conditions. Finally, Rojas and Nandi [20] have worked on the training of SVMs by using the sequential minimal optimization (SMO) algorithm. But, multi-class Support vector machines (MSVMs), based on statistical learning theory that are of specialties for a smaller sample number have better generalization than ANNs and guarantee the local and global optimal solution are exactly the same [21]. Meantime, the learning problem of a smaller number of samples can be solved by SVM. Recently, it has been found that SVMs can be effectively applied to many applications [22-25]. Due to the fact that it is practically difficult to obtain sufficient fault samples, SVMs are introduced

into rotating machinery fault diagnosis due to their high accuracy and good generalization for a smaller sample number.

In this paper, The interesting point of this investigation is the introduction of an effective method for fault detection and diagnosis in such systems through features in optioned from vibration signals, artificial neural networks (ANNs) and support vector machines (SMVs) that used for classification of rolling-element bearing faults. The extracted features from original and preprocessed signals are used as inputs to the classifiers for two-class (normal or fault) recognition. The classifier parameters This features are classified successfully using SVM and ANN classifier, The classifiers are trained with a subset of the experimental data for known machine conditions and are tested using the remaining set of data. The procedure is illustrated using the experimental vibration data of a rotating machine. The roles of different vibration signals and signal preprocessing techniques are investigated The performance of SVM have been found to be substantially better than ANN with the entire feature set.

## 2. Artificial neural network

The feed forward neural network, used in this work, consists of input layer, hidden layer and output layer. The input layer has nodes representing the normalized features extracted from the measured vibration signals.

There are various methods, both heuristic and systematic, to select the neural network structure and activation functions [26]. The number of input nodes was varied from 1 to 30 and that of the output nodes was 2. The target values of two output nodes can have only binary levels representing 'normal' (N) and 'failed' (F) bearings. The inputs were normalized in the range of 0-1. In the ANN, the activation functions of sigmoid were used in the hidden layers and in the output layer, respectively. The ANN was created, trained and implemented using Matlab neural network toolbox with Backpropagation (BPN) and the training algorithm of Levenberg-Marquardt. The ANN was trained iteratively to minimize the performance function of mean square error (MSE) between the network outputs and the corresponding target values. At each iteration, the gradient of the performance function (MSE) was used to adjust the network weights and biases. In this work, a mean square error of  $10^{-5}$ , a minimum gradient of  $10^{-10}$  and maximum iteration number (epoch) of 1000 were used. The training process would stop if any of these conditions were met. The initial weights and biases of the network were generated automatically by the program.

## 3. SVM

In order to calculate decision surfaces directly instead of modeling a probability distribution across training data, SVM makes use of a hypothetic space of linear functions in a high dimensional feature space. A support vector (SV) kernel is utilized for mapping the data from input space to a high-dimensional feature space; this makes easy the process of the problem in linear form. SVs are samples that have [28]. SVM always finds a global minimum because it usually tries to minimize a bound on the structural risk, rather than the empirical risk. Empirical risk is defined as the measured mean error rate on the training set as below:

$$R_{emp}(\alpha) = \frac{1}{2l} \sum_{i=1}^l |y_i - f(x_i, \alpha)| \quad (1)$$

where  $l$  is the number of observations,  $y_i$  is the class label and  $x_i$  is the sample vector. The structural risks, defined as a structure derived from the inner class of the function in the nested subset, find the subset of the function that minimizes the bound on the actual risk. SVM achieves this goal by minimizing the following Lagrangian formulation:

$$L_p = \frac{1}{2} \|w\|^2 - \sum_{i=1}^l \alpha_i y_i (x_i w + b) + \sum_{i=1}^l \alpha_i \quad (2)$$

Where  $\alpha_i$  is positive Lagrange multiplier [27, 28]. SVM uses some kernels to map the data from the input space to a high-dimensional feature space which facilitates the problem to be processed in linear form. In this paper, linear and radial basis function (RBF), quadratic and polynomial kernels have been used.

## 4. Feature extraction

Statistical analysis of vibration signals yields different primary and secondary parameters. Research works have been reported (McFadden & Smith, 1984) on using these parameters in combinations to elicit information regarding bearing faults. Such procedures use allied logic often based on physical considerations. We selected eleven parameters as a basis for our study. They are mean, median, standard deviation, variance, kurtosis, skewness, , minimum, Zero Crossing Rate, Peak Rate and maximum. These features were extracted from vibration signals. The statistical features are explained below (where 'N' is the number of sample points.) Some features are explained as follows.

(a) Mean:

$$m_1 = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^n \quad (3)$$

(b) Standard deviation: this parameter is a signature of the effective energy or power content of the vibration signal, and represents deterioration in bearing

condition. The following formula has been used for computation of the standard deviation:

$$\sigma = \left( \frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2 \right)^{\frac{1}{2}} \quad (4)$$

(c) Sample variance: it is variance of the signal points which can be calculated using the following formula:

$$\sigma^2 = V = \left( \frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2 \right) \quad (5)$$

(d) Kurtosis: the value of this feature, which is a representative of the flatness or the spikiness of the signal, is very low for good bearings and high for faulty bearings due to the spiky nature of the signal.

$$Ku = \frac{m_4}{m_2^2}, \quad (m_n = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^n) \quad (6)$$

(e) Skewness: this feature, representing the asymmetry of a distribution around its mean, can be obtained from the formula:

$$skewness = \frac{m_3}{m_2^{\frac{3}{2}}}, \quad (m_n = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^n) \quad (7)$$

(f) Minimum value: it refers to the minimum signal point value in a given signal. As the bearing parts (inner race, outer race and roller) get degraded, the vibration levels seem to go up. Hence, it can be utilized for fault detection.

(g) Maximum value: it refers to the maximum signal point value in a given signal.

**5. Experimental Procedure**

Two data sets, each containing twenty data files, were collected from Two bearings which are the same but with different faults. The first data file was collected from each test bearing when the loading was zero, and the bearing was Running at the highest speed (3000 rpm). The load was then increased step by step, the speed was kept at 3000rpm, and four other data files were collected. The load was then brought back to zero, and speed was decreased by 500 rpm; then, the next five data files were collected under five different loads similar to the first five data files. This procedure was continued until all twenty five sets of data were collected. The sampling frequency was chosen as 41.67 kHz; this sampling frequency along with the data record size of 4098 guarantees that the sampling procedure covers at least 1.6 revolutions of shaft at the lowest speed.

The diagram block of detection of the type of faults in bearings has been illustrated in Table (1).

**6. TEST BEARINGS**

An impact impulse is generated every time a ball hits a defect in the raceway or every time a defect in a ball hits the raceway. Each of such impulses excites a

short transient vibration in the bearings at its natural frequencies. Each time this defect is rolled over, an impact is produced whose energy depends on the severity of the defect. Many failure modes of a rolling element bearing produce such a discontinuity in the path of the rolling elements. Moreover the majority of rolling element bearing failure cases begin with a defect on one of the raceways. In this research, defects on inner raceway (IRD) and normal Bearing (GBR) are used.

**7. Conclusion**

Due to the importance of rolling bearings as one of the most populous used industrial machinery elements, development of proper monitoring and fault diagnosis procedure to suppression malfunctioning and failure of these elements during operation is necessary. For rolling bearing fault detection, it is expected that a desired time domain analysis method has good computational efficiency. A procedure is presented for diagnosis of bearing condition using two classifiers, namely, ANNs and SVMs with feature selection from time-domain vibration signals. The roles of different vibration signals and signal preprocessing techniques have been investigated. The performance of SVM have been found to be substantially better than ANN with the entire feature set.

**8. Figures and Tables**

**8.1. Figures**

In this section, the diagram block of detection of the type of faults(Fig.1), the original acceleration vibration signal for two types of faults at 3000rpm speed and 500N load have been shown (Fig.2).

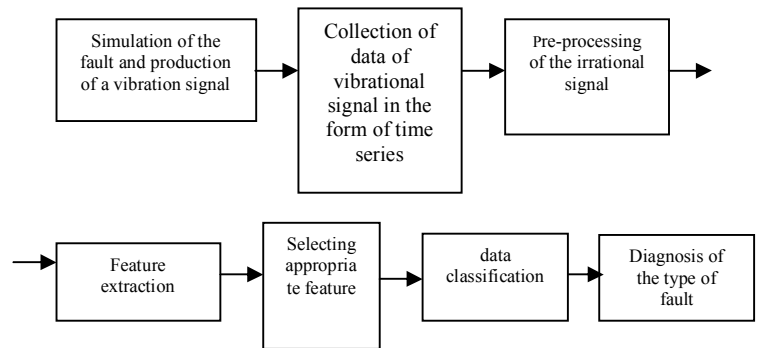


Fig. 1: the diagram block of detection of the type of faults.

(a)

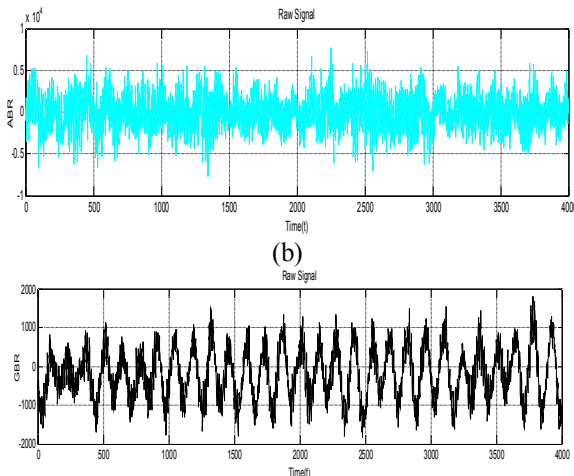


Fig.2: Original acceleration vibration of the signal for two different faults, (a): Inner race way fault, (b) Good bearing

## 8.2. Table

In this section, the roller bearing fault diagnosis for two type faults at 3000rpm speed and 1000N load have been shown in Table 1.

TABLE 1: Performance comparison of classifiers with different number of features

Number of features	Test success (%)	
	SVM	PNN
4	68	58
7	85	79
11	94	89

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## Physiological Response of Sweet Wormwood to Salt Stress under Salicylic Acid Application and Non Application Conditions

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**Abstract:** Soil salinity is one of the major environmental stresses affecting plant growth and productivity. To assess the effect of salt stress on physiological traits of sweet wormwood medicinal plant (*Artemisia annua* L.) under salicylic acid application and non application conditions a field study was conducted in Zanjan, Iran during 2010-2011 crop year in a four- replicated- factorial design laid out in randomized complete block with four salinity levels (0 (control), 4, 8, and 12 ds. m<sup>-1</sup> NaCl) and two salicylic acid levels (salicylic acid non application (control) and salicylic acid application (0.5 mM solution). Chlorophyll a content, chlorophyll b content, leaf electrical conductivity, stomatal resistance, leaf relative water content, and canopy temperature difference were determined. Results revealed that application of salicylic acid in both stress and non stress conditions increased the chlorophyll a and b content and also leaf relative water content, although leaf electrical conductivity, stomatal resistance and canopy temperature difference decreased by salicylic acid application in both stress and non stress conditions.

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### 1. Introduction

Sweet wormwood (*Artemisia annua* L.) belonging to Asteraceae family is an aromatic annual plant which uses as a medicinal plant due to several types of essential oils and alkaloid and glycoside compounds (Challa and Ravindra, 1998). The leaves of *A. annua* are a rich source of artemisinin, a sesquiterpene lactone used as the raw material for the production of semi-synthetic derivatives that are more stable, bioavailable, and effective against chloroquine-resistant strains of *Plasmodium falciparum* (Klayman, 1985; Luo and Shen, 1987; Balint, 2001; Marchese et al., 2001; Enserink, 2005; Marchese et al., 2005). Besides its antimalarial activity, artemisinin has proved effective against different types of cancer, parasitic diseases like Schistosomiasis, viral hepatitis B and some animal diseases are also known to be treated by artemisinin (Efferth 2009; Ferreira and Gonzalez, 2008).

It has been demonstrated that plant growth behavior and production of artemisinin in plant parts of *A. annua* are affected not only by genotype but also by environmental factors (Ferreira et al. 1995). Irradiation (Wang et al. 2007), salinity stress (Qureshi et al., 2005; Qian et al., 2007), chilling stress (Feng et al., 2009) and Dimethyl sulfoxide elicitation (Mannan et al., 2010) have been reported to affect plant growth and artemisinin production. In addition, phytohormones involved in the plant

defense response (e.g., abscisic acid (Jing et al., 2009) and salicylic acid (Pu et al., 2009) have also been shown to play important roles in artemisinin accumulation.

High salinity in soil or irrigation water is a common environmental problem affecting plant growth and productivity by provoking osmotic stress and ion toxicity together with induction of oxidative stress. Salinity induces water deficit even in well watered soils by decreasing the osmotic potential of soil solutes thus making it difficult for roots to extract water from their surrounding media (Sairam et al., 2002). The effect of high salinity on plant can be observed at the whole plant level in terms of plant death and/or decrease in productivity (Parida and Das, 2004). Salinity decreases germination (Gehlot et al., 2005; Sharma et al., 2004), dry matter accumulation, the rate of net CO<sub>2</sub> assimilation, relative growth, leaf cell expansion and ultimate leaf growth (Cramer et al., 2001; Saqib et al., 2004; Mansour et al., 2005).

Salicylic acid acts as a potential plant growth regulator and plays an important role in regulating a number of plant physiological and biochemical processes. Salicylic acid is a phytohormone which roles in signal transduction of a wide range of defense responses including the biosynthesis of some secondary metabolites (Hayat et al., 2010; Pieterse and van Loon, 1999). A survey of literature indicates

that salicylic acid could affect antioxidant enzyme activities and then cause a moderate increase in the content of reactive oxygen species such as hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (Ali et al., 2006; Chen et al., 1993; Harfouche et al., 2008; Mahdavian et al., 2007) which acts as a second messenger in regulating plant defense responses (Dempsey and Klessig, 1994; Hayat et al., 2010; Jaspers and Kangasjarvi, 2010). Gao Bin et al. (2009) provide evidence that salicylic acid can activate *A. annua* growth and artemisinin production. Salicylic acid is a phenolic phytohormone involved in regulating plant growth, development, photosynthesis, transpiration, ion uptake and transport, and defenses against abiotic stresses (Gao-Bin et al. 2009). Aftab et al (2011) reported salicylic acid, when applied at 1.00 mM, provided considerable protection against salt stress imposed by adding 50, 100, or 200 mM NaCl to soil.

Considering the aforementioned points, this study conducted with the objective to determine the effect of salicylic acid application on physiological traits of sweet wormwood (*A. annua* L.) under salt stress condition.

## 2. Materials and methods

### 2.1. Experimental site and design

To assess the effect of salt stress on physiological traits of sweet wormwood medicinal plant (*Artemisia annua*) under salicylic acid application and non-application conditions a factorial experiment based on randomized complete block design in four replications was carried out at the experimental farm located in Zanjan, Iran (36°40' N, 48°29' E; 1638 m Elevation) during 2010- 2011 crop year. Treatments included four salinity levels (0 (control), 4, 8, and 12 ds m<sup>-1</sup> NaCl) and two salicylic acid levels (salicylic acid non application (control) and salicylic acid application (0.5 mM solution)).

Seeds were planted in nursery on 1×1 m<sup>2</sup> beds after sterilizing with sodium hypo chloride for 5 min and ethanol (96%) for 30 sec and rinsing with distilled water for several times to remove excess of chemicals. Two month seedlings were transferred to 30 cm in diameter× 50 cm in height plastic pots (20 kg soil per pot). 50 days after transferring, plants were treated with different salinity and salicylic acid levels. Salinity levels in high salinity treatments were increased gradually to prevent sudden stress and plant death.

### 2.2. Measurements of traits

Chlorophyll a content, chlorophyll b content, leaf electrical conductivity, stomatal resistance, leaf relative water content, and canopy temperature difference were determined.

Canopy temperature was measured using an infrared thermometer (Pyropen D, Calnex Electronics Ltd.) in the morning.

At sampling stage young, mature and well developed leaves were used to measure the leaf relative water content. These leaves transferred to laboratory immediately after separation from plant, cleaned and their wet weight measured by 0.001 accuracy scale. The samples put in distilled water for 24 h under no light condition in laboratory. Their saturated weight determined. The leaves were put in electrical oven for 48 h in 80°C and their dry weight measured. The leaf relative water content determined according to following equation (Turner and Jones 1980):

$$\text{Leaf Relative Water Content (RWC)} = \frac{\text{leaf wet weight} - \text{leaf dry weight}}{\text{leaf saturated weight} - \text{leaf dry weight}} \times 100$$

Stomatal resistance was determined with an AP<sub>4</sub> Prometer (Delta-T Devices, UK).

7 days after treatment of plants, leaves of 3 plants in each treatment were used to measure leaf electrical conductivity. In laboratory, leaves were cut to 1-cm<sup>2</sup> segments. Segments of each sample were put in one tube containing 10 ml distilled water and tubes were incubated at 25°C on a rotary shaker (100 rpm) for 24 h. Electrical conductivity of bathing solution (EC1) was measured using Micro EC Meter after 24 h. Then each tube autoclaved at 120°C for 20 min to release all electrolytes, cooled to 25°C and the final electrical conductivity (EC2) was measured. Electrolyte leakage rate was determined as:

$$EL = \frac{EC1}{EC2} \times 100$$

The hurt rate of cell membrane permeability was calculated using following equation (Bai Wen-Bo et al., 2008):

$$HR = (ELT - ELCK) \times 100$$

Where HR is the hurt rate (%) and ELT and ELCK are the electrolyte leakage of the treatment and control, respectively.

To measure chlorophyll a and b content, chlorophyll extraction was performed by putting leaf segments in 80% aqueous acetone at 4°C in darkness during the night. The extract was centrifuged for 5 min at 10000× g and absorption rate of supernatant fraction in 645, 663 and 480 nm wavelengths were determined using Spectrophotometer (Arnon, 1949).

### 2.3. Statistics

Statistical analyses of data were performed with a personal computer using the SAS software. A factorial analysis of variance (ANOVA) was performed for all parameters. In addition the Duncan's Multiple Range Test (DMRT) (*P* = 0.05) was used to conduct mean comparison.

## 3. Results and discussion

### 3.1. Chlorophyll a content

The simple effects of salicylic acid and salinity and the interaction effect of them on chlorophyll a



content were all significant at  $P=0.01$  (Table 1). Application of salicylic acid on average  $0.927 \mu\text{m g}(\text{fw})^{-1}$  showed a significant preference in comparison to non application of salicylic acid on average  $0.857 \mu\text{m g}(\text{fw})^{-1}$  in chlorophyll a content more production. Also chlorophyll a content decreased by increasing salinity level from 0 to  $12 \text{ ds m}^{-1}$  as the lowest rate of chlorophyll a content on average  $0.687 \mu\text{m g}(\text{fw})^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of treatments revealed that the highest chlorophyll a content on average  $1.111 \mu\text{m g}(\text{fw})^{-1}$  and the lowest chlorophyll a content on average  $0.627 \mu\text{m g}(\text{fw})^{-1}$  obtained in salinity level of  $0 \text{ ds m}^{-1}$  under application of salicylic acid condition and salinity level of  $12 \text{ ds m}^{-1}$  under non application of salicylic acid condition, respectively. Application of salicylic acid in both stress and non stress conditions increased the chlorophyll a content (Table 3).

### 3.2. Chlorophyll a content

The simple effects of treatments and their interaction effect on chlorophyll b content were all significant at  $P=0.01$  (Table 1). Application of salicylic acid on average  $0.919 \mu\text{m g}(\text{fw})^{-1}$  showed a significant preference in comparison to non application of salicylic acid on average  $0.799 \mu\text{m g}(\text{fw})^{-1}$  in chlorophyll b content production. Also chlorophyll b content decreased by increasing salinity level as the lowest rate of chlorophyll b content on average  $0.595 \mu\text{m g}(\text{fw})^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of treatments showed that the highest chlorophyll b content on average  $1.212 \mu\text{m g}(\text{fw})^{-1}$  and the lowest chlorophyll b content on average  $0.544 \mu\text{m g}(\text{fw})^{-1}$  obtained in salinity level of  $0 \text{ ds m}^{-1}$  under application of salicylic acid condition and salinity level of  $12 \text{ ds m}^{-1}$  under non application of salicylic acid condition, respectively. Application of salicylic acid in both stress and non stress conditions increased the chlorophyll b content (Table 3). Aftab et al. (2010) also showed application of salicylic acid positively improved chlorophyll and carotenoid contents in sweet wormwood. Aftab et al. (2011) reported salinity reduced the values of photosynthetic attributes and total chlorophyll content and inhibited the activities of nitrate reductase and carbonic anhydrase in sweet wormwood.

### 3.3. Leaf electrical conductivity (EC)

The simple effects of treatments and interaction effect of them on leaf electrical conductivity were all significant at  $P=0.01$  (Table 1). Non application of salicylic acid on average  $2003.25 \mu\text{s cm}^{-1}$  had higher leaf electrical conductivity in comparison to application of salicylic acid on average  $1752.00 \mu\text{s cm}^{-1}$ . Also leaf electrical conductivity increased by increasing salinity level from 0 to  $12 \text{ ds m}^{-1}$  as the

highest rate of leaf electrical conductivity on average  $2439.50 \mu\text{s cm}^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of treatments revealed that the highest leaf electrical conductivity on average  $2597 \mu\text{s cm}^{-1}$  and the lowest leaf electrical conductivity on average  $1208 \mu\text{s cm}^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  under non application of salicylic acid condition and salinity level of  $0 \text{ ds m}^{-1}$  under application of salicylic acid condition, respectively. Application of salicylic acid in both stress and non stress conditions decreased the leaf electrical conductivity (Table 3). Aftab et al. (2011) reported salt stress significantly increased electrolyte leakage and proline content.

### 3.4. Stomatal resistance

The simple effects of salicylic acid and salinity and their interaction effect on stomatal resistance were all significant at  $P=0.01$  (Table 1). Non application of salicylic acid on average  $3.732 \text{ s cm}^{-1}$  showed a higher stomatal resistance in comparison to application of salicylic acid on average  $2.995 \text{ s cm}^{-1}$ . Stomatal resistance increased by increasing salinity level from 0 to  $12 \text{ ds m}^{-1}$  as the highest rate of stomatal resistance on average  $5.46 \text{ s cm}^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of salicylic acid and salinity revealed that the highest stomatal resistance on average  $5.94 \text{ s cm}^{-1}$  and the lowest stomatal resistance on average  $1.75 \text{ s cm}^{-1}$  obtained in salinity level of  $12 \text{ ds m}^{-1}$  under non application of salicylic acid condition and salinity level of  $0 \text{ ds m}^{-1}$  under application of salicylic acid condition, respectively. Application of salicylic acid in both stress and non stress conditions decreased stomatal resistance (Table 3).

### 3.5. Leaf relative water content (RWC)

The simple effects of treatments and their interaction effect on leaf relative water content were all significant at  $P=0.01$  (Table 1). Application of salicylic acid on average 87.75% showed a significant preference in comparison to non application of salicylic acid on average 83.72%. Also leaf relative water content decreased by increasing salinity level from 0 to  $12 \text{ ds m}^{-1}$  as the lowest rate of leaf relative water content on average 76.70% obtained in salinity level of  $12 \text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of treatments revealed that the highest rates of leaf relative water content obtained in salinity level of  $0 \text{ ds m}^{-1}$  under both application and non application of salicylic acid conditions on average 94.8% and 93.9%, respectively. The lowest leaf relative water content on average 75.1% obtained in salinity level of  $12 \text{ ds m}^{-1}$  under non application of salicylic acid condition. Application of salicylic acid in stress condition increased the leaf relative water content (Table 3).

Table 1. Analysis of variance components for assessed traits

S.O.V.	DF	<i>CaC</i>	<i>CbC</i>	<i>LEC</i>	<i>SR</i>	<i>LRWC</i>	<i>CTD</i>
Replication	3	*	ns	**	**	**	**
Salicylic acid	1	**	**	**	**	**	**
Salinity	3	**	**	**	**	**	**
Salicylic acid × Salinity	3	**	**	**	**	**	**
Error	21						
Total	31	-	-	-	-	-	-
CV	-	1.5903	2.4209	0.3443	2.2248	0.8147	2.3029

\*, \*\* – significant at 5% and 1% respectively, ns – not significant

Table 2. Simple effects of salicylic acid and salinity on assessed traits

Treatments	Mean					
	<i>CaC</i> ( $\mu\text{m g(fw)}^{-1}$ )	<i>CbC</i> ( $\mu\text{m g(fw)}^{-1}$ )	<i>LEC</i> ( $\mu\text{s cm}^{-1}$ )	<i>SR</i> ( $\text{s cm}^{-1}$ )	<i>LRWC</i> (%)	<i>CTD</i> ( $^{\circ}\text{C}$ )
Salicylic acid						
Non application	0.857 b	0.799 b	2003.25 a	3.732 a	83.72 b	-3.45 b
Application	0.927 a	0.919 a	1752.00 b	2.995 b	87.75 a	-2.755 a
Salinity ( $\text{ds m}^{-1}$ )						
0	1.100 a	1/119 a	1261.50 d	1.82 d	94.35 a	-1.815 a
4	0.959 b	0.951 b	1710.50 c	2.50 c	89.25 b	-2.485 b
8	0.821 c	0.771 c	2099.00 b	3.59 b	82.65 c	-3.565 c

Any two means sharing a common letter do not differ significantly from each other at 5% probability.

Table3. Interaction effect of salicylic acid and salinity on assessed traits

Treatments	Salinity	Mean					
		<i>CaC</i> ( $\mu\text{m g(fw)}^{-1}$ )	<i>CbC</i> ( $\mu\text{m g(fw)}^{-1}$ )	<i>LEC</i> ( $\mu\text{s cm}^{-1}$ )	<i>SR</i> ( $\text{s cm}^{-1}$ )	<i>LRWC</i> (%)	<i>CTD</i> ( $^{\circ}\text{C}$ )
Salicylic acid							
Non application	0	1.09 b	1.03 b	1315 g	1.89 f	93.9 a	-1.87 b
	4	0.921 d	0.905 d	1879 e	2.98 d	86.2 c	-2.99 d
	8	0.793 f	0.721 f	2222 c	4.12 c	79.7 d	-3.97 f
	12	0.627 h	0.544 h	2597 a	5.94 a	75.1 f	-4.97 h
Application	0	1.11 a	1.212 a	1208 h	1.75 g	94.8 a	-1.76 a
	4	0.998 c	0.997 c	1542 f	2.02 e	92.3 b	-1.98 c
	8	0.849 e	0.822 e	1976 d	3.07 d	85.6 c	-3.16 e
	12	0.747 g	0.646 g	2282 b	4.98 b	78.3 e	-4.12 g

Any two means sharing a common letter do not differ significantly from each other at 5% probability.

Traits in *italic*, *CaC*, *CbC*, *LEC*, *SR*, *LRWC*, and *CTD* are assigned for chlorophyll a content in  $\mu\text{m g(fw)}^{-1}$ , chlorophyll b content  $\mu\text{m g(fw)}^{-1}$ , leaf electrical conductivity in  $\mu\text{s cm}^{-1}$ , Stomatal resistance in  $\text{s cm}^{-1}$ , leaf relative water content in %, and canopy temperature difference in  $^{\circ}\text{C}$ , respectively.

### 3.6. Canopy temperature difference

The simple effects of salicylic acid and salinity and their interaction effect on canopy temperature difference were all significant at  $P = 0.01$  (Table 1). Non application of salicylic acid on average  $-3.45^{\circ}\text{C}$  showed a higher difference in comparison to application of salicylic acid on average  $-2.755^{\circ}\text{C}$ . Also canopy temperature difference increased by increasing salinity level from 0 to  $12\text{ ds m}^{-1}$  as the highest rate of canopy temperature difference on average  $-4.545^{\circ}\text{C}$  obtained in salinity level of  $12\text{ ds m}^{-1}$  (Table 2). Study of the interaction effect of treatments showed that the lowest canopy temperature difference on average  $-1.76^{\circ}\text{C}$  obtained in salinity level of  $0\text{ ds m}^{-1}$  under application of salicylic acid condition. The highest canopy temperature difference on average  $-4.97^{\circ}\text{C}$  obtained in salinity level of  $12\text{ ds m}^{-1}$  under non application of salicylic acid condition. Application of salicylic acid in both stress and non stress conditions decreased the canopy temperature difference (Table 3).

### 4. Conclusion

Adjustments in chemical elicitors such as salicylic acid can be used as an effective method to increase *A. annua* growth and powered defense responses. This study provides new findings about the physiological changes in *A. annua* in response to salicylic acid application under salt stress condition. Our results revealed that chlorophyll a and b content and leaf relative water content increased by application of salicylic acid and decreased by increasing salinity level lonely. Although leaf electrical conductivity, stomatal resistance and canopy temperature difference responded differently and decreased by salicylic acid application and increased by increasing salinity level. The highest and lowest chlorophyll a content b content and leaf relative water content obtained in salinity level of  $0\text{ ds m}^{-1}$  under application of salicylic acid condition and salinity level of  $12\text{ ds m}^{-1}$  under non application of salicylic acid condition, respectively. The highest and the lowest leaf electrical conductivity, stomatal resistance and canopy temperature difference obtained in salinity level of  $12\text{ ds m}^{-1}$  under non application of salicylic acid condition and salinity level of  $0\text{ ds m}^{-1}$  under application of salicylic acid condition, respectively. Application of salicylic acid in both stress and non stress conditions increased the chlorophyll a content and b content and leaf relative water content, although leaf electrical conductivity, stomatal resistance and canopy temperature difference decreased by salicylic acid application in both stress and non stress conditions.

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## A Novel Miniaturized Microstrip Low-pass Filter with Wide stopband using a Modified Hairpin Resonator

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**Abstract:** In this paper, a novel miniaturized low-pass filter (LPF) with wide stopband and low insertion loss using a modified hairpin resonator is presented. By optimizing the dimensions of the modified hairpin resonator and addition of a symmetric semi-circular open-end unit as a suppressing cell, the undesirable response and unwanted harmonics are suppressed; hence, a wide stopband from 5.94 GHz to 32.27 GHz is achieved. The transition band is 0.4 GHz from 5.54 GHz to 5.94 GHz with the attenuation level of -3 dB and -20 dB, respectively. The proposed LPF with -3 dB cut-off frequency of 5.54 GHz is designed, fabricated and measured. The size of the fabricated low-pass filter is only 73.84 mm<sup>2</sup>. The simulated results are compared with the measured results and good agreement between them is obtained.

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**Keywords:** Hairpin resonator, Low-pass filter, Wide stopband

### 1. Introduction

Microstrip low-pass filters have been widely used to suppress harmonics and spurious signals in communication systems. Compact size, low insertion loss, sharp roll off, and wide stopband are highly desirable factors to design the LPFs.

One of the main microstrip structures to design a LPF is the hairpin structures, which has benefits such as easy fabrication [1].

A LPF with wide stopband using coupled line hairpin unit has been presented in [2]. In this filter, the insertion loss and the return loss in the passband and the attenuation level in the stopband are not adequate. In [3], a LPF with the shunt open stubs at the feed points of a center feed coupled line hairpin resonator has been proposed with very wide stopband and sharp response, but the rejection level and the  $S_{11}$  parameters in the stopband are not satisfactory.

The conventional stepped-impedance filter, with hairpin resonator, in [4] has a simple structure, but it provides a gradual response in the transition band. In [5] a low-pass filter using stepped impedance hairpin units has been proposed, which has a low insertion loss, but it is not compact and has a gradual transition

band, also it does not have a wide stopband. In [6], a LPF based on microstrip coupled-line hairpin unit, spiral slot and open stubs has been presented.

It has a compact size with an approximate wide stopband, but its frequency response is gradual in the transition band.

In this paper, a hairpin resonator is modified by open-end step impedance stubs to have a sharp response with -3 dB cut-off frequency of 5.54 GHz. To suppress the harmonics in higher frequencies a symmetric semi-circular unit is added to the proposed resonator. The result is a compact wide stopband LPF with optimum specifications such as low insertion loss less than 0.13 dB and good return loss better than 15.8dB, in the passband.

### 2. Filter design

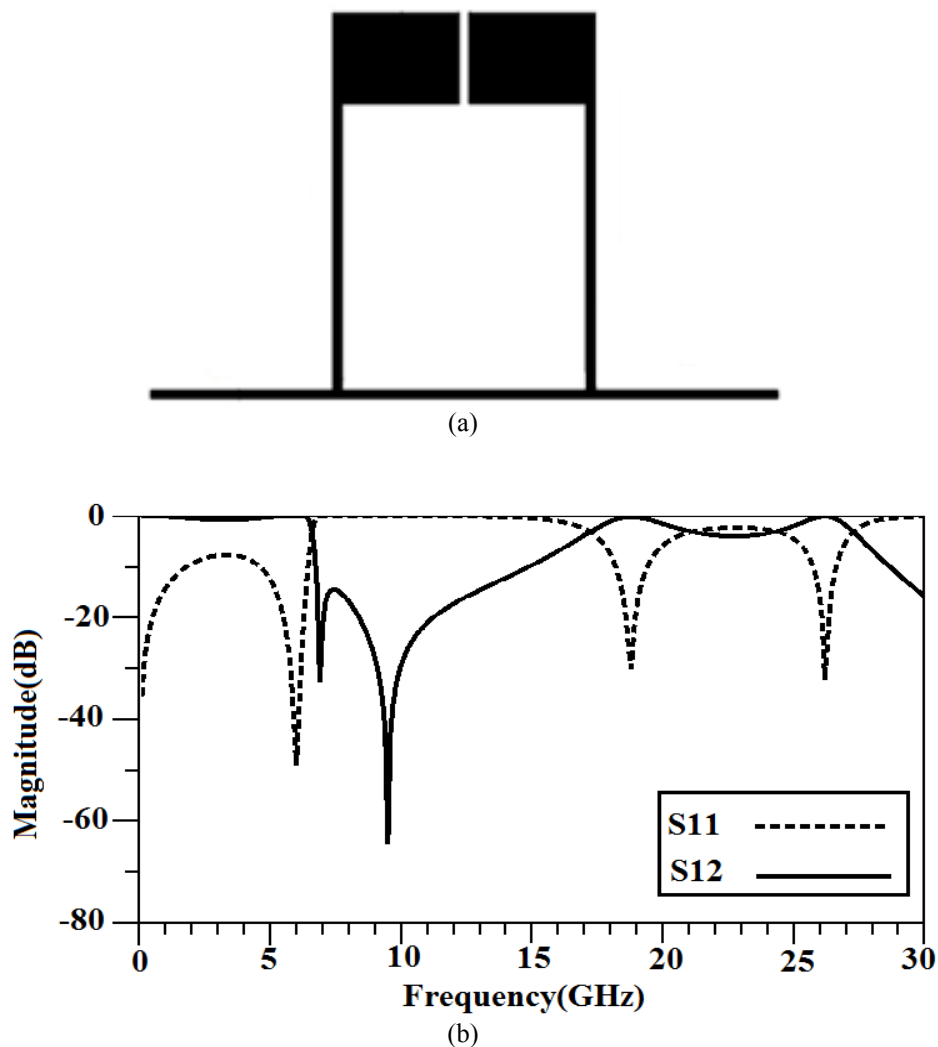
In the first step, an appropriate prototype elliptic function hairpin low-pass resonator is selected as shown in Figure 1(a). The simulated S-parameters of the proposed hairpin resonator, which is designed to

have a -3 dB cut-off frequency of 5.54 GHz, is shown in Figure 1(b).

The resonator creates two transmission zeros at 6.9 GHz and 9.5 GHz with the attenuation level of -32.81

dB and -64.65 dB, respectively.

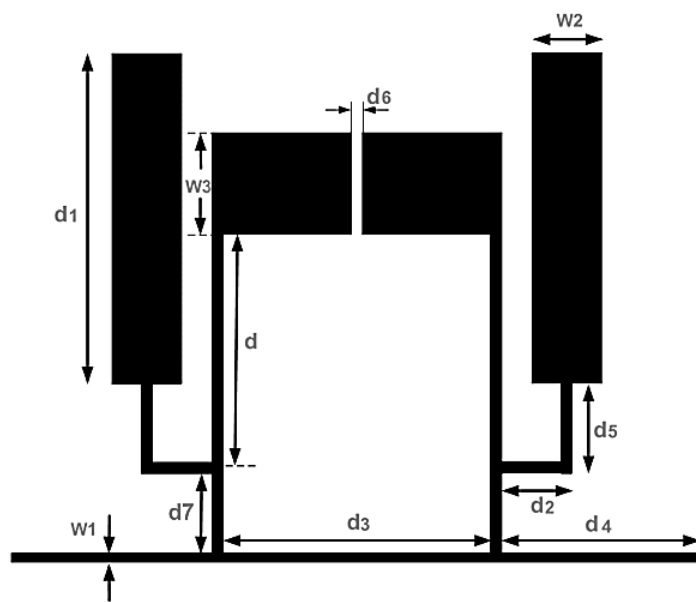
As seen from Figure 1(b), the most important problem in this structure is the insertion loss in the passband, which has a large value about 0.82 dB.



**Figure 1.** (a) The proposed hairpin resonator; (b) The simulated S-parameters of the proposed hairpin resonator

To solve this problem, a step impedance open-end unit is symmetrically added to the proposed hairpin resonator as shown in Figure 2. By adding these

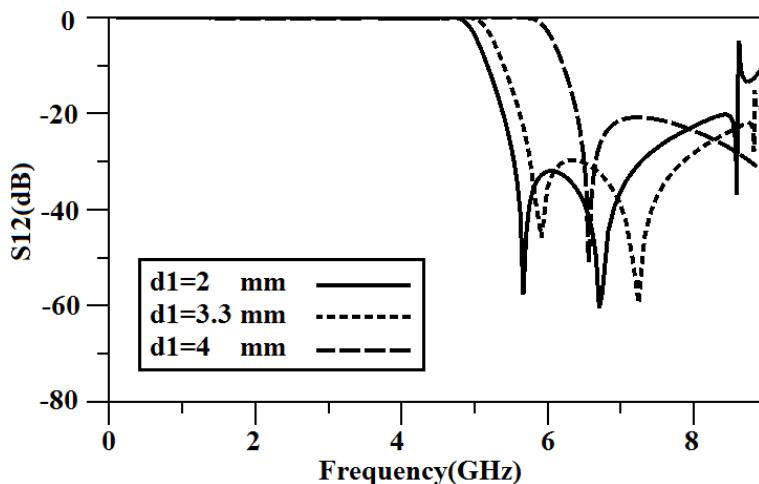
arms, the order of the circuit (filter) is increased; hence the return loss in the passband is improved and a good insertion loss nearby 0 dB can be obtained in the passband.



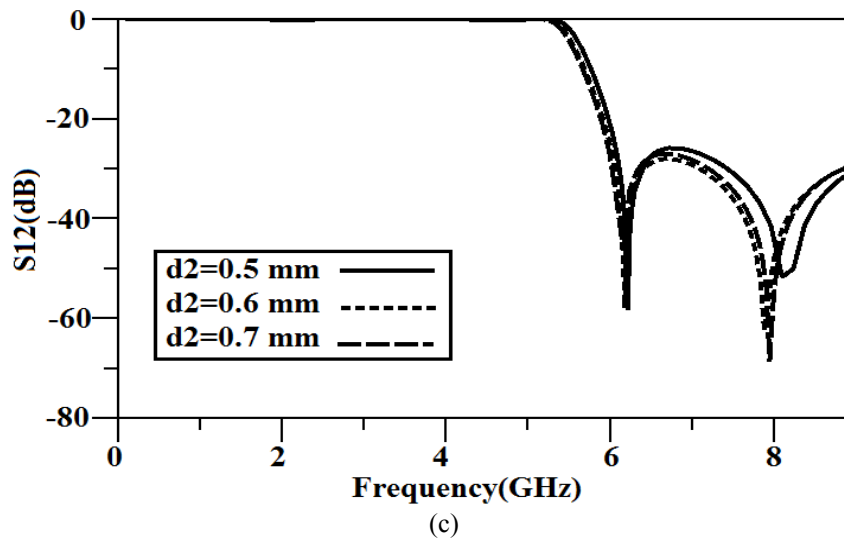
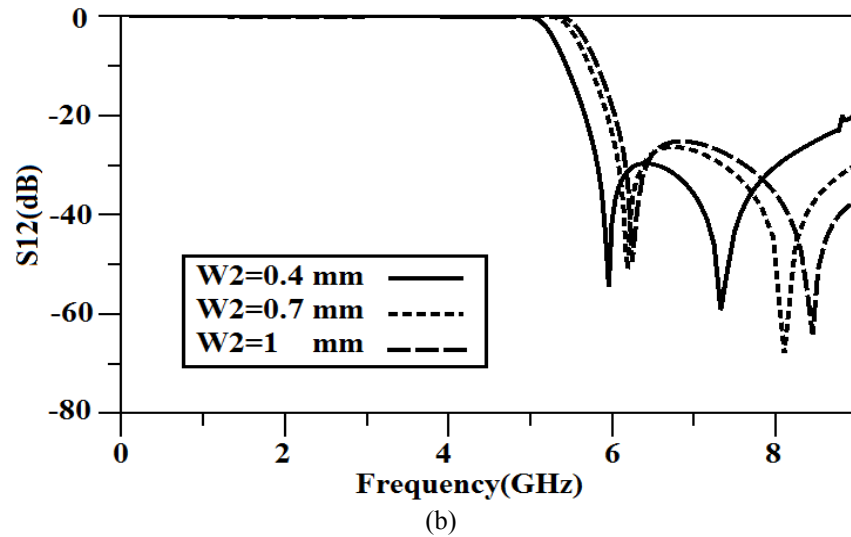
**Figure 2.** The improved proposed hairpin resonator resulted with the addition of symmetric open-end stubs

Figure 3(a) and Figure 3(b) shows the S12 parameter of the proposed resonator as a function of  $d_1$  and  $W_2$ , respectively. Clearly, by increasing  $d_1$  from 2 mm to 4 mm and  $W_2$  from 0.4 mm to 1 mm, the capacitance of the added open-end stub with length of  $d_1$  and width of  $W_2$  increases, hence the transmission zeros get smaller to have a sharper transition band. The S12

Parameter of the proposed resonator as a function of  $d_2$  is shown in Figure 3(c). As seen from the Figure, by changing the distance between the open-end step impedance stubs and the hairpin resonator, the transmission zeros don't move significantly, it means that the coupling capacitance between these units can be negligible.



(a)



**Figure 3.** (a) The  $S_{12}$  parameter of the proposed resonator as a function of  $d_1$ ; (b) The  $S_{12}$  parameter of the proposed resonator as a function of  $W_2$ ; (c) The  $S_{12}$  parameter of the proposed resonator as a function of  $d_2$

With respect to the optimization with an EM simulator (ADS), the dimensions of the improved proposed hairpin resonator are obtained as follows:  $d = 2.3$ ,  $d_1 = 3.3$ ,  $d_2 = 0.7$ ,  $d_3 = 2.7$ ,  $d_4 = 2$ ,  $d_5 = 0.9$ ,  $d_6 = 0.1$ ,  $d_7 = 0.8$ ,  $W_1 = 0.1$ ,  $W_2 = 0.7$ ,  $W_3 = 1$ , all in mm.

The simulated S-parameters of the proposed improved hairpin resonator is shown in Figure. 4. As seen, the resonator has a sharp transition band and low insertion loss less than 0.15 dB in the passband with -3 cut-off frequency at 5.5 GHz.



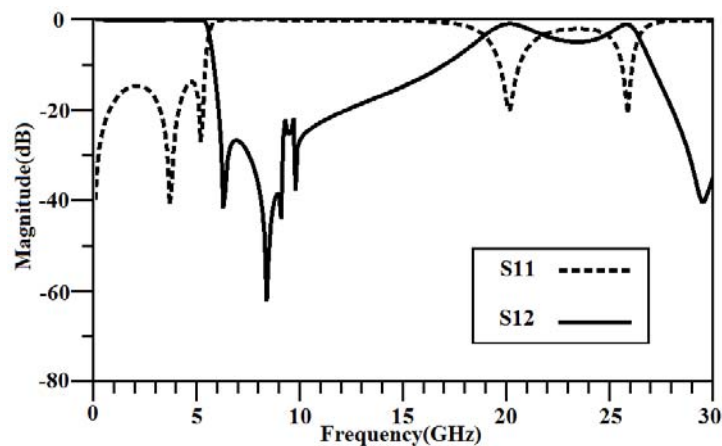


Figure 4. The simulated S-parameters of the proposed improved hairpin resonator

To extend the stopband, a symmetric semi-circular open-end cell as shown in Figure 5 is used.

This microstrip cell is used to perform the -20 dB suppression in the frequency range of 13 GHz to 32 GHz. The S<sub>12</sub> parameter of the proposed suppression

cell is shown in Figure 6.

As seen, the suppression cell creates a transmission zero at 22.5 GHz with the high attenuation level of -61.5 dB, which provide a wide stopband for the proposed LPF.

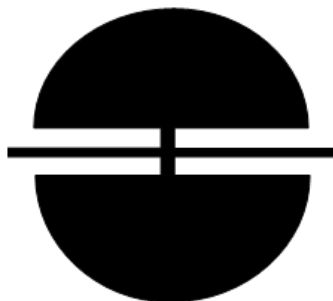


Figure 5. The symmetric semi-circular open-end unit as suppression cell

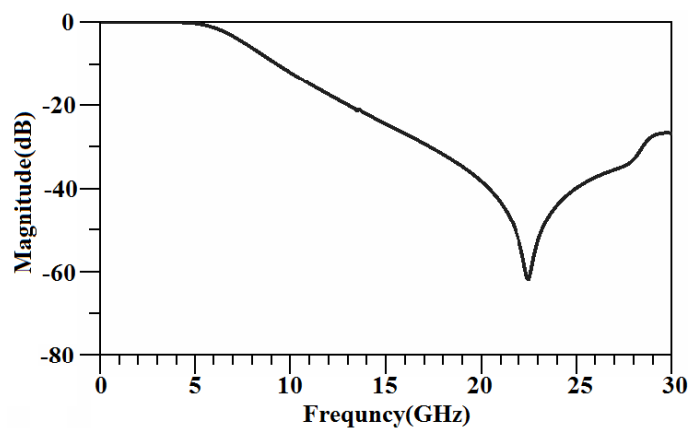


Figure 6. The S<sub>12</sub> parameter of the proposed suppression cell

### 3. Simulation and measurement results

The layout of the fabricated low-pass filter is shown in Figure 7. The source and the load of the structure have characteristic impedance of  $Z_0$  equal to  $50 \Omega$ . The remaining dimensions of the LPF are as follows:  $a=2$ ,  $b=1.7$ ,  $d_8=0.6$ ,  $d_9=0.8$ ,  $W_4=0.2$ ,  $W_5=1.5$ , all in

mm. The proposed low-pass filter is implemented on (RT/Duriod 5880) substrate with relative permittivity, height and a loss tangent equal to 2.2, 15mil and 0.0009, respectively. The photograph of the fabricated filter is shown in Figure 8.

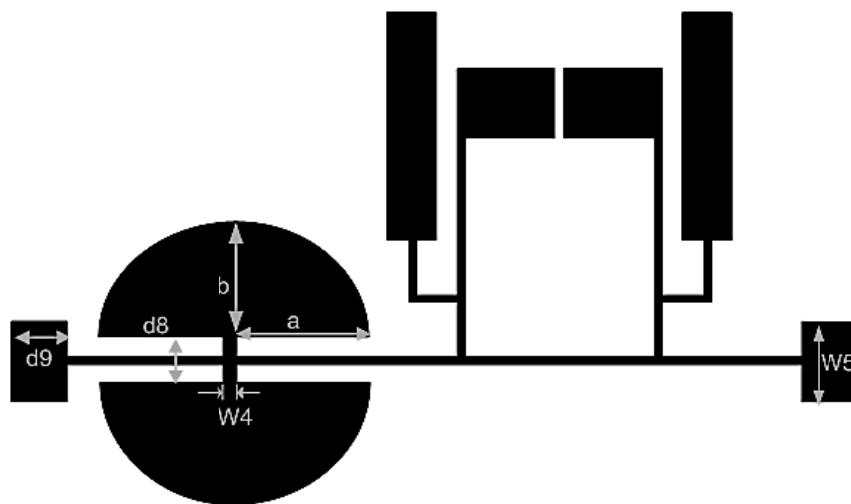


Figure 7. The layout of the fabricated low-pass filter

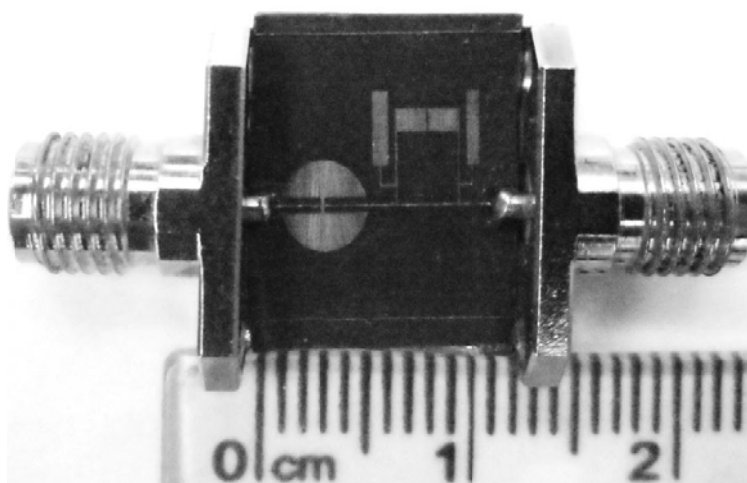


Figure 8. The photograph of the fabricated filter

The simulated and measured results of the proposed filter are illustrated in Figure 9. The measurements of the proposed LPF are carried out using an HP8757A network analyzer. As seen, the attenuation level in the stopband is higher than -20 dB. The stopband width (SBW) is achieved from 5.94 GHz to 32.27

GHz, which shows a wide stopband. The proposed filter has low insertion loss (IL) of less than 0.13 dB and return loss (RL) of more than 15.8 dB in the passband. The frequency response of the filter is adequate sharp with the transition band equal to 0.4 GHz from 5.54 GHz to 5.94 GHz with corresponding attenuation levels of -3 and -20 dB.

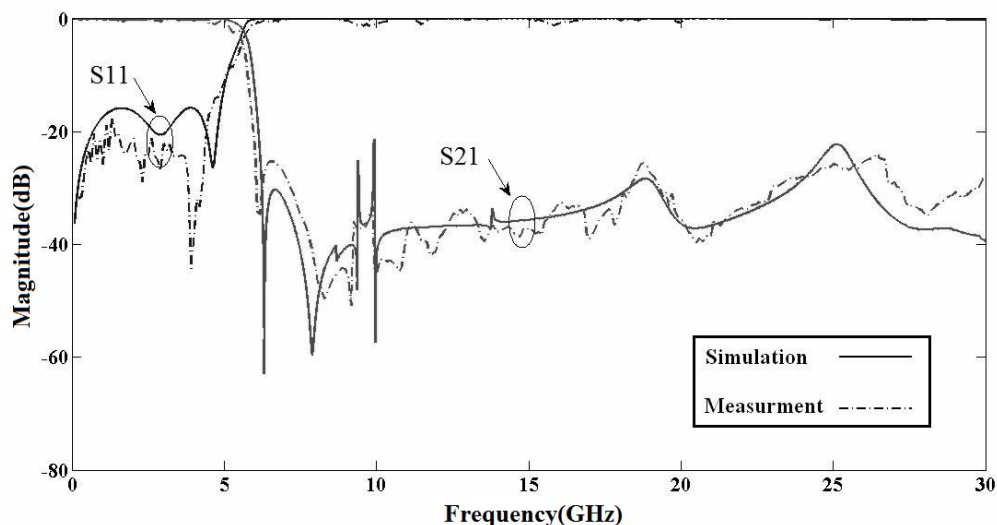


Figure 9. The simulated and measured results of the proposed filter

Table 1. Performance comparison of the proposed LPF with other works.

Ref.	$\epsilon_r$	$f_c$ (GHz) <sub>#</sub>	SBW	Size(mm <sup>2</sup> )	RL ( dB)	IL(dB)
[2]	2.2	2.4	12.6	20×23	10	1.2
[3]	4.3	0.5	3.7	34.62×70.95	16.3	0.5
[4]	10.8	1.5	5.4	23.1×7.5	16.42	0.7
[5]	2.65	1	4.5	22.4×24.25	20	0.4
[6]	2.2	2	20	10.2×15.15	10	1
[7]	2.2	5.45	31.3	50×4.42	15	0.15
<b>This work</b>	<b>2.2</b>	<b>5.54</b>	<b>26.33</b>	<b>10.4×7.1</b>	<b>15.8</b>	<b>0.13</b>

As seen from Figure 10, the group delay in the passband for the proposed LPF has a maximum

variation about 0.6 ns.

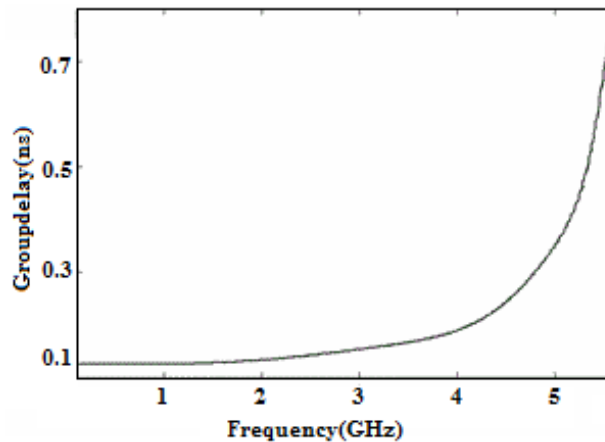


Figure 10. The group delay through the passband

The comparison between the performances of the proposed filter with the other works is shown in Table.1. As seen from the table, the proposed LPF has the best insertion loss in the passband, among the other works. The size of the filter is only 73.84 mm<sup>2</sup>, the smallest size among [1-7], and also a wide stopband among the quoted hairpin filters [2-6]. The sharpness of cutoff frequency from -3 dB to -20 dB is about 0.4 GHz that is just 7.2% of the bandwidth and is sharper than [2-8].

#### 4. Conclusion

A novel compact low-pass filter using a new modified hairpin resonator loaded by open-end stepped impedance stubs is designed, fabricated and measured. The measurement results show that the fabricated filter has many benefits such as compact size, low insertion loss in the passband, wide stopband and sharp transition band. The proposed LPF with these features is a good candidate for the modern microwave applications.

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## Wear behavior comparison between hard chrome and molybdenum based plasma spray coating on spheroid graphite cast iron

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**Abstract:** In this article, wear behavior, hardness and adhesion of hard chrome coating and molybdenum based plasma spray coating on the base metal of spheroid graphite cast iron has been compared. First of all, sample from base metal with the dimension of 30× 120 mm were prepared, then on the samples, hard chrome and molybdenum based plasma spray coating with identical thickness has been devised. Metallographic, micro hardness and wear testing were done for comparison. Wear test results shown that in the similar condition for both coating, molybdenum based plasma spray coating has better wear resistance

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**Keywords:** Hard Chrome coat, Molybdenum coat, cast iron base, mechanical properties, wear.

### 1. Introduction

Properties of engineering pieces are not only dependent to their inner properties, but also dependent on their properties and characterizations of their surface [1]. This is especially true about cast iron pieces which are faced to wear, because they have to provide general properties required for pieces and also their surface have to be hard and resistible. Different coating is used on cast iron to increase mechanical and corrosion properties on pieces surface [2, 3, and 4].

Hard chrome coat can be obtained using electrolysis of chromic acid solution, and this acid is the main factor of process. There are many factors effecting on hard chrome coating process, if these factors go out of control there might be some default on coating. High hardness of electrochemical chrome coating leads to call it hard chrome in industry. One of important properties of hard chrome is low surface energy of it, and it is one of the metals with the lowest coefficient friction, so it is one of the most practical metals in industry. In addition most of liquids and solids cannot stick easily on chrome coat, so the chrome coat will remain clean and shine and has more durability.

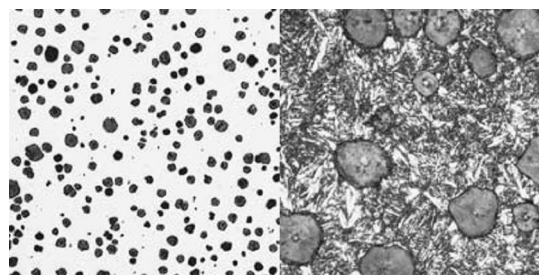
Nowadays, plasma spray process is used for creation of coating with high wear resistibility and resistibility against corrosion. This method is used to increase wear resistibility of spices like bearing rein, sealers, valve seats, turbine motors, and refinery spices and so on. Plasma spray coating and generally all thermal spray coating are used widely in different industries. Molybdenum base coating on spices increase their surface corrosion resistibility notably, and resistibility of thermal spray coating of

molybdenum against adherent wear can be controlled using coating parameters [5].

In this article chrome coating and molybdenum based plasma spray coating on the base metal of spheroid graphite cast iron has been compared. Metallographic, micro hardness and wear testing were done for comparison, and the result will be discussed.

### 2. Materials and Methods

Standard samples for wear and metallographic test were cast at Ring Khodro Pars Company, experimental samples of spheroid cast iron ( with spherical graphite) based on structure and basement of figure 1 and based on chemical analysis of table 1, then 30×120mm dimension were obtained using machinery process. Since investigation of Wear and mechanical behavior of hard chrome and molybdenum based plasma spray coating on spheroid graphite cast iron was the purpose of this work, it was attempt to get the cast iron base of the samples, without casting fault such as Mac.



**Figure1.** Structure and basement of graphite cast iron [6]

Table1. Chemical analysis of graphite cast iron [6]

C	3.5 - 4.0
Si	2.4 - 3.2
Mn	max 0.5
P	max 0.3
S	max 0.05
Cr	max 0.2
Cu	max 1.0
Mg	max 0.1

### 2.1. Plating process of hard chrome on samples

Hard chrome coat was made on 15 samples using electrochemical plating process at Ring Khodro Pars Company. This was done by several steps; base surface polish, preparation and de fat of piece by three ethylene chlorate, rust removal, cleaning and sometimes heating, hard chrome plating, cleaning and drying, final polish and gas ans tension removal after polishing .Figure 2 shows process of hard chrome coat creation on samples. Specifications of electrochemical solution which was used are based on table 2.



Figure2. Hard chrome coat creating process

Table2. Specifications of electrochemical solutions

Material	Quantity
CrO3	300 g/l
SO <sub>4</sub> <sup>2-</sup>	2.3 g/l
F <sup>-</sup>	0.55 g/l
CH <sub>3</sub> SO <sub>3</sub> <sup>-</sup>	4.2 ml/l
Cr <sub>2</sub> O <sub>3</sub>	2 g/l

### 2.2. Plasma spray process on samples

In plasma spray process, thermal energy was obtained from electrical arc (usually between 40 to 80 K.W.) and a plasma gas which is usually Argon or Nitrogen for melting and throwing of coating materials with high speeds (600 m/s) on surfaces. The main use of this system is for generation of high temperature, around 16000°C. This high temperature is for spray materials with high melting point. Coating materials are often powders and for translating them into needle a carrier gas is needed. High speed and melting materials can make high

strength bond in coat. Schematic of this process is presented in figure3.

At thermal spray process, samples were at a fixed place like figure 4 fixer for getting the coat. In this article for a solution based on chemical composition of table 3 was used for coating Molybdenum base. After creating chrome and base molybdenum coat on samples by electrochemical and plasma spray method, coat thickness on all samples got the same value of  $\mu\text{m}100$  by grinding. Figure 5 shows samples after coating and grinding.

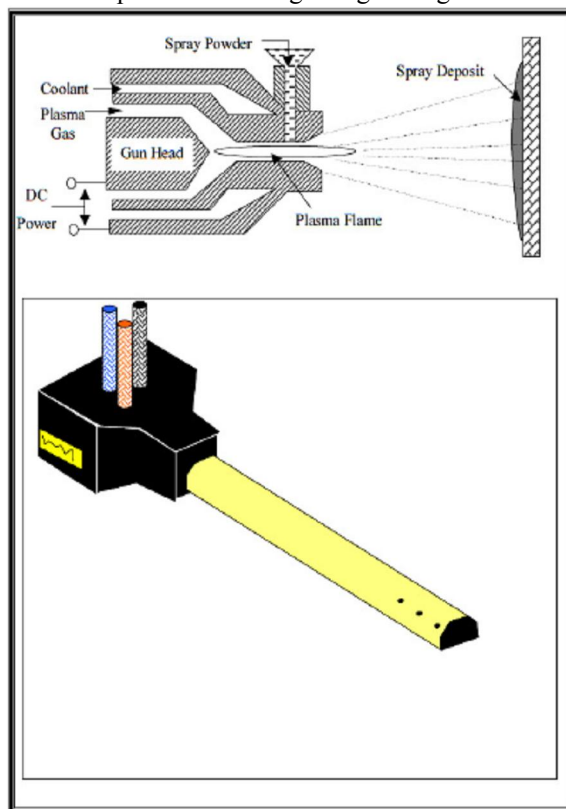


Figure3. Plasma spray process schematic



Figure 4. Plasma spray gun on samples for molybdenum coat creation

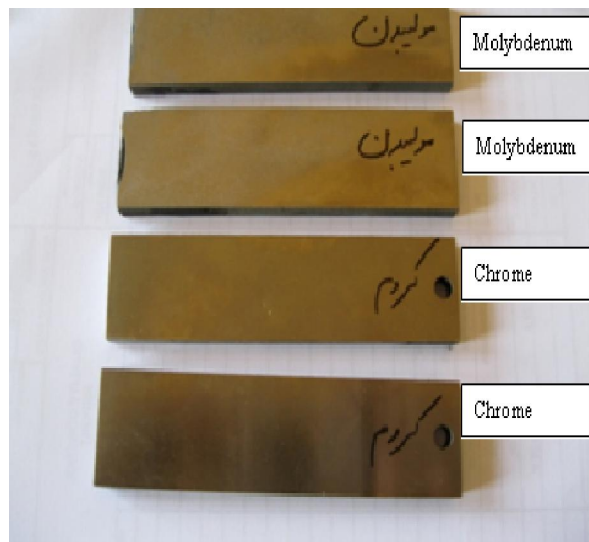


Figure 5. Coated samples after grinding

Table 3. Chemical composition of molybdenum coat powder

Element	Ni	Cr	B	Si	Fe	Mo
Weight percent	18	4/5	%8	2	1	-

### 3. Results and discussions

#### 3.1. Results of wear test for comparison between hard chrome and molybdenum based plasma spray coating

For wear test the Pin test was done on cubic samples. This test was based on ASTM G99 standard. In this test the value of weariness was obtained by weight or volume reduction. Coefficient of friction was also calculated using this test. In this test a pin of 52100 steel with 63HRC hardness were put vertical on hard chrome and molybdenum coated blocks, after passing a specified distance with a specified force, weight (volume) reduction per distance was measured.

Based on standards, samples were washed, dried and weighted with 0.0001g accuracy before test. It is important to note that the samples should not wash with Chlorinated solutions or solutions which can make films. Samples were fixed on device, proper force and necessary speed was specified by controller sections of device. Output of this test is the wear rate based on coefficient of friction and slip distance. In this work the weight reduction was used for wear studies. Wear test and wearing pin conditions are listed in table 4.

Weight of samples was measured using Sartorius LA-230S balance with 0.0001g accuracy. After starting the test weight reduction of sample was measured in 100, 200, 300, 500, 700, 1000 m distance. Figure 6 shows the used device for wear test.

Diagram of friction coefficient based on slip distance was draw simultaneously by wear device employing following formula:

$$\mu = \frac{F}{N}$$

Where F is friction force which is recorded based on mentioned process, and N is vertical force of pin on the sample.



Figure 6. Wear test device

Table 4. Wear test and wear pin conditions

High temperature wear test	Parameter
10 (N)	Vertical force
8(m/ min)	Pin speed
85(mm)	Wear path distance
Steel pin 52100	Wear
1000 (m)	Slip distance

#### 3.1.1. Studies of weight change of samples due to wear

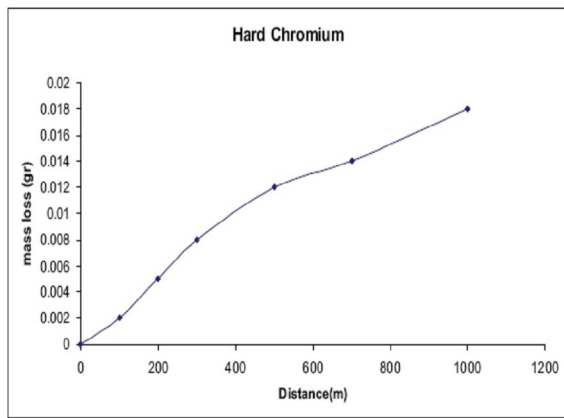
Diagrams of weight reduction of hard chrome and molybdenum coating on graphite cast iron samples are present at figure 7 and 8, and figure 9 shows the comparison of them. As it can be seen due to 1000m wear on both samples with same conditions, molybdenum coat samples had the less wear in weight scale. Based on column diagram of weight reduction of figure 9 with comparison weight changes of coats it can be predicted that wear age of molybdenum based plasma spray coat is twice than hard chrome coat.

#### 1.1.1. Studies of frictional condition of samples due to wear and analysis of wear mechanism

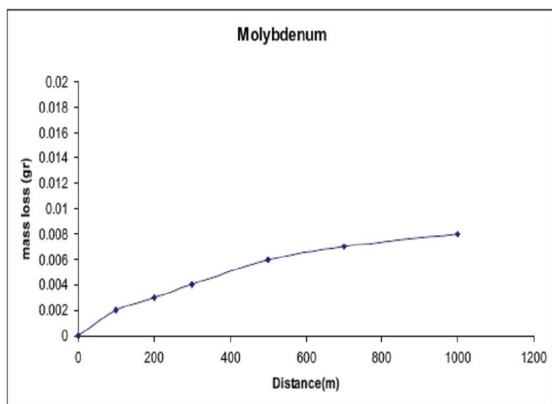
Friction coefficient diagram of coated samples with hard chrome and molybdenum are presented at

figure 10 and 11. As it can be seen in figures molybdenum coat had the lower friction coefficient in comparison 52100 steel than hard chrome. This is in agreement with weight reduction result. This is because of more wear particles from hard chrome coat wear, 3 bodies grazing wear condition and increase of friction coefficient due to fouling of wear particles between pin and coat.

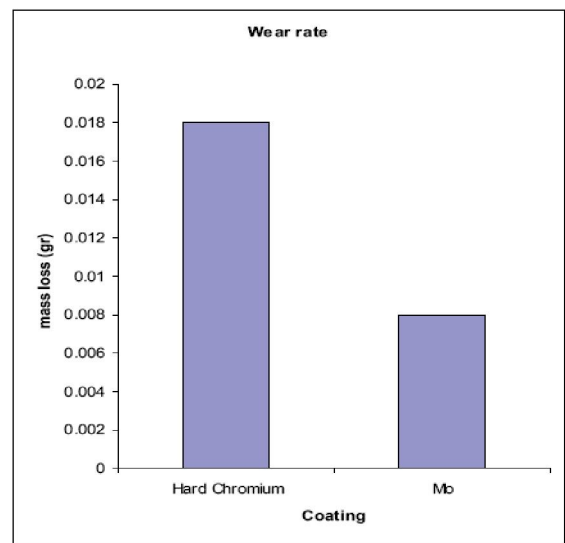
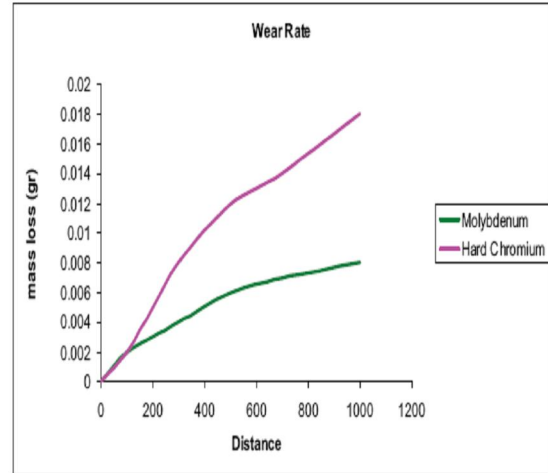
Wear test shows 52100 wear pin on hard chrome coat had more weight reduction than molybdenum coat, and this indicate that hard chrome coat has more wear than molybdenum (generally due to existence of grooves and activation of grooves mechanism) and also it makes more wear on other splices. Fluctuations in hard chrome coat friction coefficient diagram per distance is due to cutting of bigger particles from coat surface and tackling of them between pin and coat, this indicates superficial wear and rejoining of grooves and remove of coat due to tensions.



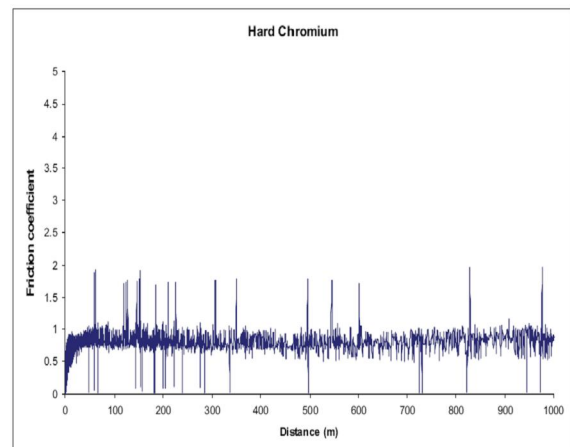
**Figure 7.** Diagram of weight reduction of hard chrome coat samples



**Figure 8.** Diagram of weight reduction of molybdenum coated samples.

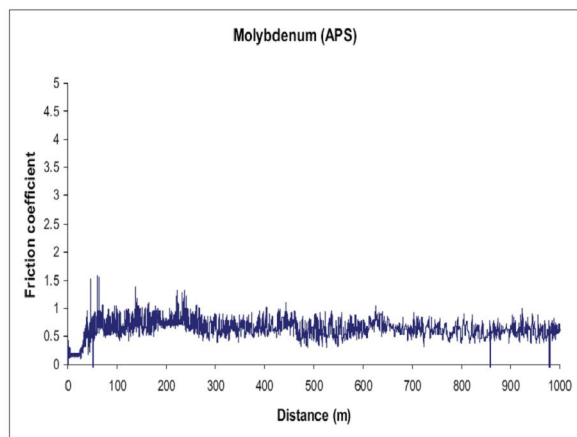


**Figure 9.** Comparison weight reduction changing of coats



**Figure 10.** Friction coefficient of hard chrome coated samples





**Figure 11.** Friction coefficient of molybdenum coated samples

### 1.2. Studies of hardness of hard chrome coat and plasma spray molybdenum coat

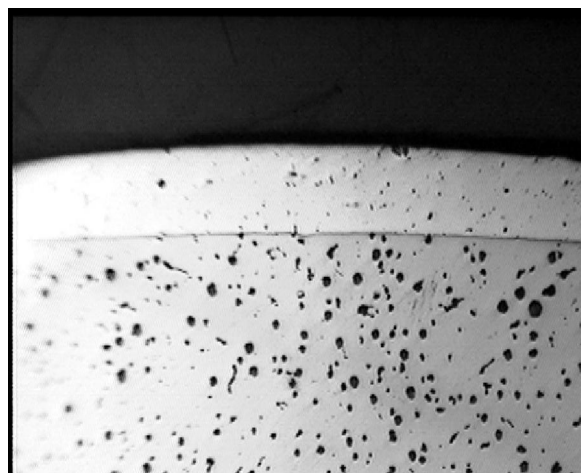
Studies of hardness and wear behavior relation of coats was done by Vickers hardness test on four samples of molybdenum coat and four samples of hard chrome coat. Hardness of chrome coat is 900-1150 HV 0.1 as it can be seen in figure12. The main point about molybdenum coat is existence of two different phase of molybdenum (bright phase) and other elements phase NiCrBSi (dark phase). Clarifying of dark and bright phase of molybdenum coats (figure 13 and 14) can be done using H Murakami solution [7]. Because of existence of two different phase of molybdenum (bright phase) and NiCrBSi phase (dark phase) Vickers hardness test was used in coating section, as it can be seen in optical microscope of Vickers hardness test device dark and bright phase were test individually, and the mean hardness for 10 effected point of any phase was reported as final hardness of any samples.

Mean hardness of dark phase is 468.7HV 0.05 and mean hardness of bright phase is 896.7HV 0.05 . Therefore, based on wear and hardness test molybdenum coating with less hardness has better operation as far as wear is concerned.

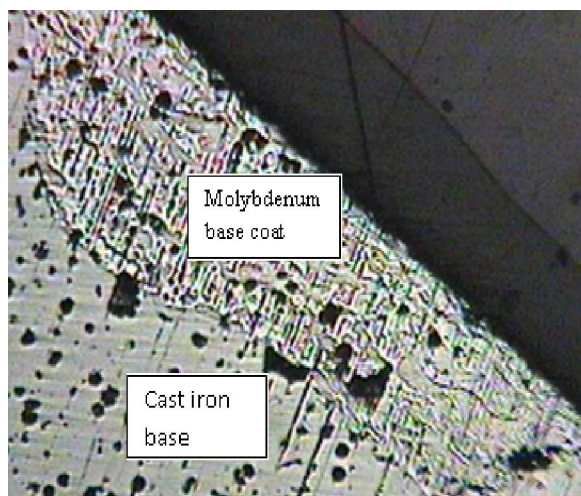
### 1.3. Coat adherence test

Adherence test was done on samples of figure 15 to study the coating adherence to substrate based on standard (ASTM C633-1). Samples of base metal in cylindrical shape of 25mm diameter and 38mm high were prepared. One side of them was sandblast and coated. Coated surface of samples was stacked to same samples without coating, using epoxy of 50 Mega Pascal epoxy and was put into tension test device using special fixer, and was separated using tension force. Studies on all samples of hard chrome and molybdenum coat show that separation was not

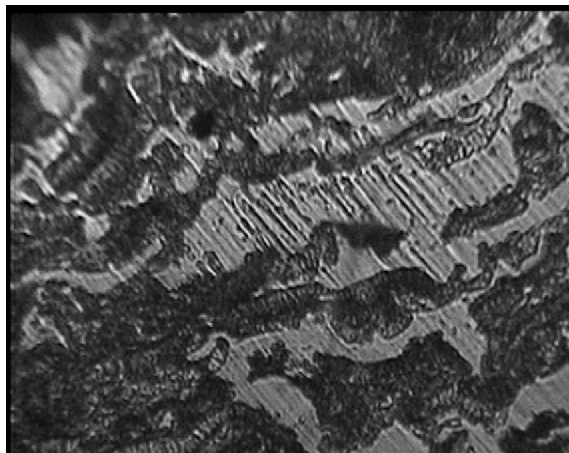
from interface of coat and sample, and it was in epoxy itself, therefore it can be accept that for both coating adherence is more than 50 Mega Pascal ,which is a notable amount. But due to limitations in epoxy power, we couldn't answer which coating has higher adherence.



**Figure 12.** Hard chrome coat on cast iron with spherical graphite



**Figure 13.** Molybdenum coat on cast iron with spherical graphite before H Murakami solution



**Figure 14.** Molybdenum coat after H Murakami and creation of dark and bright phase



**Figure 15.** Adherence test sample

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11/8/2012

**According to Electronic causes and resolve the conflict with other evidence of the criminal law**

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**Abstract:** Today, most obviously in criminal matters, electronic Excursion to prove or detecting crime is very important. Environments that currently occur in the crimes and criminals, as well as extensive use of technology - new technologies, capabilities are considerable. So naturally one would need to invoke the court's e Excursion criminal in the contemporary world. Iran too is no stranger to the penal system. According to the Iranian legal system has both legal and moral system, Excursion, Excursion judge can be morally citing electronic Excursion will also be provided. For judges, the system must satisfy the conscience of ethical reasons and because it can be an electronic reason, simply based on the true path, and the judge may attempt to come to a verdict. it is raised. In addition, because the urethra should be clear that if this theory is confirmed by an expert or a judge of the high conflict, how it is. This article presents a brief and compact the material.

[Fatemeh ameri. **According to Electronic causes and resolve the conflict with other evidence of the criminal law.** *Life Sci J* 2012;9(4):4210-4214] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 628

**Keywords:** e the reason digital evidence conflicts, mostly expertise, knowledge of the judge, electronic evidence

**The concept of electronic evidence**

Research must be defined before any of its terms. So the two words are defined and electronic Excursion. Together because the "evidence" is, in general terms, which is not only legally harvested there. In a word, it means guidance is the fact. In such a case, because it is actually the bridge between the two. What term refers to the practice of law to prove that the concept of such rights. Of law, because by revealing the truth and reveal something about the claims of the parties and the other party is deny.

It is noteworthy that the distinction between the words "electronic" and "digital" is. According to some, the "e" in a broad definition of technology related to electricity, digits (zero and one), magneto-, bi - wires, light, electromagnetic or similar capabilities, they say -. However, "Digital (figure) to analog (analogue) to anything that is said by - digits (zero and one) is built.

The difference is that the first electronic digital - is more general meaning in addition to electronic digital aspect is the analog of "can be."

Electronic Excursion reasons including both analog data such as voice, video and data with devices - an electrical device that appeared to move them capabilities are, like computers, audio recorders, mobile phones and So video, audio, digital photos, bar and lines can be electronic reason. For reasons such as compact discs, rather Computers and digital electronic promotional reasons such as electronic Excursion it can also be learned.

What about the rights of other Electronic comes Excursion is ultimately an "abstract concept" is a reason. This means that if the written document can be

cited as an example of a piece of paper and Electronic forgery forgery, in what proved to be invoked -.

The collection of figures and numbers that appear in the form of screen displays is Citing the precedent of Electronic evidence

**Citing the precedent of Electronic evidence**

You first stated that Iran's legal system, Excursion, both legal and ethical (moral persuasion) is accepted. So the whole point of citing electronic Excursion legal legitimacy. Registration and event information because there is no system manipulation than some traditional Excursion such testimony, has more features is

Camera is better than at 1 month after a witness who wants to give his testimony, and the possibility of forgiveness, persuasion and human interaction with video recording, obvious superiority over the considered one Most of them are essentially hidden nature of the offenses committed, the degree of electronic via electronic means is more significant

After studying the importance of inter - national electronic evidence is also apparent.

If a legal system, simply due to persist traditional and electronic evidence matters little whether or not the position is much lower than traditional reasons to have more, in many cases the reasons for the offender and prevent the acquisition of "a penal to be interlunar River.

The other point being, as well as other reasons for an electronic criminal law should be studied from the legal and legitimate. Thus, "if the student is a reason, regulations and legal requirements are not met, because it has no legal value is considered to be.

**Excursion invoke different capabilities of e-crime**

One of the most important issues related to the difference in the crimes. God is right. For example, approximately, the exact amount of the penalty is the law forecasts pre, often two testimonies and confessions, the absence of which the number of counts, not nearly stationary, the requirement to prove a crime. Now you can reason a perhaps even more striking certain testimony to be added to them or even complete of them can be used as an Excursion?

The first might be replied that Cited as proof of the truth of God into many of the area based on the reasons stated in the law, as opposed to the tried hard. The minimum sentence because the basis of the opinion of jurists and legal texts as  $e \rightarrow$  can not be fixed. So Excursion legal reason such testimonies and confessions in front of the electronic crime such as stoning for adultery, which is a great feature should not be. records of the case can also be seen.

In one famous case, a man with his wife secretly filmed footage adultery with another man, he realizes, and he sued. Therefore, the acquisition electronics (video), which was also the last time he suspects his wife is put in canal shooting video cooler his home, he found his wife's infidelity in her absence and be  $\rightarrow$  He was in charge of the film to court to complain. In this petition, a cheating wife, and the film has been arrested, convicted by a criminal court is. It is interesting that her husband could not believe  $\rightarrow$  consequences are heavy penalties, the court irrespective of their complaints - I think that the type of offense  $\rightarrow$ ,  $\rightarrow$  is not the consent of.

Many believe that the legal system in most countries, including Iran, Islamic jurisprudence, film and tape lawsuit has not proved adequate in the Excursion and have the proven ability to the vote is issued solely with reference to the direction of the film was flawed and it's a violation of voting. Because the law court should be reasonable and documented legal and constitutional principles upon which the vote is issued and the Penal Code puts Excursion movie has been proven guilty of any other offense so if the vote is issued solely by virtue of this film was flawed and it's a violation of voting. The point is that we can and we want to express that we infer  $\rightarrow$  judge. If the hearing officer's observation  $\rightarrow$  films, the moral persuasion could accordingly proceed to sentencing. So the basis of the judge's ruling, the matter is referred to them for 105 and 199, the sentence should not be interpreted as support.

In contrast, when the judge's e Excursion is not delinquent in cases of conflict between the positive proof of the existence of e-Excellence and distinction with Excursion is proof of that. The same issue is raised in the court case against the film Branch also been admitted by the defendant's cell phone appeared. The judge and lawyers because they did not have any

misdemeanor citation based solely on the defendant confessed to the crime were proven

One of the use cases for offenses such as murder and robbery in the mail. The criminal procedure of instance, in a case he claimed that the alleged offenses were other people with him, and he fled the scene of a motor no sign of them not available to the film his lawyer cited the scene had been murdered by agents. However, due to the lack of quality films, but clearly it did not prove it to the judge that the records were. In some of these cases were due.

The court's 606-page description file is written to the police about Ardakan city With the deployment of experienced officers visited the scene of the murder at about Ardakan And his views on whether the shoes of the victim and the accused at the scene of the murder but the current one is there is another current Check (in the film] of bicycle tires, motorcycle tires of the shoe or the foot of another person or whether the vision has been evident if the scene was filmed, the film will be submitted for consideration. Early in the film that proves the rule motorcycles. This film legally it could be by the emirate's judicial officer to make the offense is taken pursuant to Article 43 of the Code of Criminal Procedure, except in the chastity of proceedings and judges can inspect study or investigation of the witnesses or gathering information and evidence and crime statistics, or any other actions necessary to know the education required for the detection of crime and law enforcers are referred to the actions of circumstantial evidence. Another suspect in a murder case by the officers of the identity of the corpse photos and video is taken to the end of the study indicate round of the act committed judge, of course documented to forensics the suicide it confirms that photos and videos directly to a judge does not refer

#### **Electronic reason against swear**

One reason is sworn to fight to prove that the criminal law is better than the civil rights position. In most of the cases related to criminal law swore he can learn from it given the where performance and position that jurists were allowed to swear in the Shiite jurisprudence can hardly be said that this issue has a higher position in the Electronic. The Court therefore properly Tehran on 22/2/1367 at the hearing have stated in sworn application. The amendment to Article 1335 of the Civil Code, applicable in cases where an oath or not another exchange or other reasons, they vow to strengthen weak and, therefore, where Excursion other such document or testimony or examination local research and expertise is concerned about not swear. "Finally, Article 280 of the Civil Procedure explicitly religious works swear never knows "about the religious right does not oath, unless the theft is just the right side fixed swear, but the

robbery with I swear it was not fixed. However, that sort of compares and contrasts the e-mail address because the need for the judge is satisfied conscience. Swear is a legitimate reason to be  $\neg$  course having its own terms and in statistical evaluation, it is the judge's charge And without the reassurance and persuasion inner judge, credit will not be among them. New Slate Article 207 of the Islamic Penal Code states that "approximately the swear will not be constant, but retribution losses resulting from the crime, according to the provisions of this Act shall be verified by swear.

### **Electronic evidence tracking the current Iranian legal system**

The evidence already cited examples of that many cases, and even in some cases, as already mentioned Subject to review only for an electronic proof that the dominant causes of crime records and electronic. For example, the punishment of those who in 1386 approved audiovisual activities are illegal, can prevailing charges are subject to online illegal images or videos unauthorized sentence to the judge in the check them. In case No "20/27/1324 M - A" person in charge of illegitimate relationship of film and judge his prosecution was part of a documentary (a) and Note 5 of the law, the offender knew. Iran's penal code, any sounds or images recorded remarkable about the study, there is no secret to people in authority And view these documents from the court of the emirate's judicial evidence, along with other Excursion in the case, and yet could not be  $\neg$  cause of their acceptance does not their secret. This is precisely the view of the jurists that such documents and circumstantial evidence suggest be considered legal proof, but it does not comply. The rights of the legislator who called off due to not  $\neg$  knows, some authors with different arguments as immoral without warning sound recording, audio duplication probability. Prove the validity of the charges is fundamentally illogical because they know. In certain international conventions, and technologies to gather authentic electronic evidence is emphasized. Article 112 of the Articles of Association regarding the International Criminal Court inter Register of Interrogation of accused in certain cases in different sections, audible or visual recording of the conversation between the investigator and interrogator who is able. The lyrics are: "The main bar or one of the original tapes in the presence and in the presence of his lawyer, questioning of him after signing interrogation the prosecutor and his attorney duly stamped and registered or the.

If you could e a reason, the emirate's judicial, must be stated with reasons why such documents and testimony admitted that diagnosis implies that the only reason for the fight, as Justice of credit Assigned stop the conscience convince the judge and make sure she

has been The current procedure Excursion valid e-particularly those related to movies, digital pictures and Internet system is see theory has become an expert usability review. So often refer to electronic Excursion expert will assess. In such a case, the expert opinion is also considered significant. In other words, we must consider what the position of human rights expert is

### **Benchmark Electronics expert evidence**

First of all the BS and the order of the matters referred to him be  $\neg$  stated. The lexical meaning of terms such as expert, informed use of technology that is. According to the legal definition, an expert is a person who, because of the expertise, knowledge, and information technology is a cost-effective  $\neg$  sentencing court can actually assist. In the example, be corresponding to a digital image, an expert should be things like Photoshop and ... Be familiar. This is the language of legal judicial Power Administration has stated: "... The authority [BA], competence and expertise in the field of information and knowledge and not having license  $\neg$  particular expertise of specialist's focus so much attention to the restoration of law and Article 13 of the Judiciary Act of 1365 official experts in each zone of jurisdiction, the court can. Are the official experts and non-toxic, anyone who knows to do good and proper subject matter expert, who choose. So when you gain expertise represents a technical issue related to the subject of dispute, and not its Judgment, the Court can not itself have emerged, and in particular the scientific reach and have to resort to be expertise. But then it should be clear what condition the court must on expert opinion because the asked about electronically? The answer to the above question is referred to the Supreme Court Judges stated. Ratings No. 3890 dated 31.02.1325 provides that the court Special attention is needed where expert diagnosis, it is subject to applicable technical ideas other than this way Cease to apply technical expertise to identify it or not, depending on the judge .

"In addition, the third branch No. 3135 dated 30.09.1391 of the Supreme Court also ruled that the lyrics "if the technical detection, that be necessary for the court to act, not to be drawn into his tenure experts and expert. However, if the only reason why electronic records is one thing to require proof of competency theory expert, and without it and the judge misses precise consequence statement Collection Cycle theory of expert is a court ruling in stop at Attempted civil Affairs according to the Article 259 judgment not and law of Civil Procedure and in a criminal lawsuit to void may lead to the defendant's innocence, however, is out evidence because of Dad.

### **Place of electronic evidence from expert opinion**

Refer to the experts with regard to the legal provisions and the procedure is clearly present in all encounter's deal with Electronic Excursion necessary for them to refer the matter to the experts there. The Civil Procedure Law refers to the court can the issue referred to the expert.

Therefore, the verb to be the judge's hands because no expert on direct address is also left open. In such a case, it is assumed that the evaluation of e cited the case raised much needed expertise and technology could not judge the conventional science, it based on about a satisfy the conscience issuing Rating.

But the important question is when and getting the theory of expert judges that the sentence is going. However, the court is required to issue its decision based on? Because the issue referred to the expert's expertise in the area based abroad or not to refer  $\rightarrow$  Expert tour. However, it must be admitted that if the expert's theory, and uncertainty was evident perhaps be that the judge will investigate it further and bring it to another expert. However, in order to master the theory if there is manipulation or the presiding judge to ensure that the theory is wrong with forms, judge to give effect to it. This material has been legally prescribed. Article 265 of the Civil Procedure Law states the relationship - is: "If the expert researcher and circumstances known to the expert does not match, the Court of it does not" he says. In addition, under the legal theory of management advisory judicial Power If the theory turns out to master the situation and realized the problem is not granted, the court will not follow the expert opinion.

#### **Should do everything in his theory reflects detect**

So the important point is that if the electronic verification by an expert and reliability has been proven that it is possible to ignore the judge? In other words, you can not judge  $\rightarrow$  or resources to expert judgment?

#### **No electronics expert Excursion attract**

However, the judge also ruled that without expert opinion. This may be in terms of jurisprudence within the title of judge's knowledge, he said. This is the case in many former and current legal texts are considered. Famous mostly Shiite scholars, it is the judge's authority. The writings of Sheikh Tosi: judge ruling could all provisions, including financial, of, death and God and law rights, according to our knowledge, to judge. There are several materials of current Penal Law Judge at the sentencing Saeb knows. Clear - most of the material, article 105 of the Penal Code. It is expressed as. Articles 120, 199 and 231 are also similar statements in support of "judge's knowledge" as a matter of evidence, are mentioned Slate penal provisions in the new emphasis on the judge's there. Article 210 that poetry - that "items such as expert

opinion, examination, location, location research, information statements, reports and other enforcers of documentary evidence and the UAE can be a judge. Inferential knowledge that the judge is not convinced, however, cannot be the criterion for judgment. In the six decades of the Supreme Judicial Council in matters of legal and judicial response to the question said. At that time, according to the council Judge for achieving any kind of research that science education certainly does not prohibit. The judge, ruling on the basis that no forms appear.

#### **The result**

Benefit because e is the appropriate response to contemporary developments. On the one hand, criminals step with contemporary developments of novel techniques for the benefit of other crimes before the law's current human needs. Go to school because it's innovative and efficient tools and new, in fact, are fast to stay ahead of the convoy, E reasons for the Rights of years - not so much as a reason, circumstantial evidence and the judge's finger is stressed out

Reasons may sometimes be referred to expert theory The situation with regard to the provisions of Community law and the Judge it usually cited and punished according to the But when the evidence with expert opinion may have been approved to judge as circumstantial evidence for the attainment of knowledge, he will be.

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## Story writing in Iran and Arabic world

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**Abstract:** As the title implies, the present work is on trend of story writing in Iran and Arabic world. The author tries to develop a picture of the evolution of story writing in Iran and Arabic world. Short story was first emerged in Iran and Arabic world in 3<sup>rd</sup> and 4<sup>th</sup> decades of 20<sup>th</sup> century, when pioneers of modernism found it essential to trigger evolution in literature. In this process, authors were successful in utilizing modern Western techniques for narrating stories pertinent to their society. Gradually they emerged as rivals to their Western counterparts.

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### Introduction

History of story writing in Iran and Arabic world shows that short story in Iran experienced faster development rate, whether in time or motivation. Consequently, Iranian authors play the leading role in the region.

Once known as story writing, narrative literature has a scientific definition and definite borders. It is now discussed as a scientific field and course. A routing life is of no value for being recorded and what makes a life worthy for narration are challenges and happenings which push the train out of its usual track. There are different ways for recording such events such as report, essay, diary, history, and most importantly story.

The gist of the issue lies with fundamental and constructive role of narrative literature in evolution and formation of cultural and literal heritage of society. In addition, there is a need to recognize and determine role of this type of literature in Iranian society and make a comparison with its Arabic counterpart as both have many in common.

### History of narrative literature

Due to poetic tendency of Iranian and Arabs, story writing in Farsi and Arabic literature is not comparable with poem. This is why that there is no definite principle regarding narrative literature in Iran and other Arabic countries. Social and economic revolutions brought in social changes and led poem and stories toward taking more understandable tongue. Studying the trend of evolution and consequent results in contemporary literature might help us to develop a reliable understanding of contemporary literature.

First groups of Iranian student in the West brought back new beliefs and ideology concerning relation between government and people and many admired the Western civilization. Narrative literature in Iran and Arabic worlds showed first sign of

evolution and innovation at this age and introduction of new meaning broke the age-old boundaries of literature. Those who supported the traditional literature were challenged by new generation. Relation with the West also promoted publications, translation, and journalism as well. Thereafter, narrative literature, once part of prose literature, was also defined as an independent field of literature.

One of the Arab's first contacts with West was in 1798 when Napoleon invaded Egypt and afterward an invasion of European culture ample with English, French, Russian, and Italian words to different parts of Arabic words was triggered.

It is not reasonable to think that stories and novels were emerged at once. The fact is before modern story writing techniques, different types of story writing were popular. Indeed, story changes along with changes in society life and ideology. Sometimes it emerges as myth and once as drama, epic, biography, or novel. Modern society nowadays experiences it as movies and TV series. While dynamic form of story gives authors plenty of tools in their work, it also help the reader for better perception of literature.

To put this in another term, in spite of narration, story writing has a short history. As pointed out by Foster, primitive human narrated their day every night while eating prey meat. History of story writing can be traced back up to four centuries. (Foster, translated by Youneshi, 1990, 32)

Modern and classic novels and stories were first born by Don Quigote of Servantes and short stories were first introduced in early 19<sup>th</sup> century. (Moam, translated by Degan, 1985, 327-328).

The effect of Europe on Iran and Arabic world in this regard is not deniable and the outcome is emergence of Jamalzadeh, Sadegh Hedayat, Jabran Khalil Jabran, Amin Alreihani, and Najib Majfouze. To open the discussion first an introduction on story



frame, types, and form is presented in the following section.

Story is a narrative text aimed to narrate realities or feelings. The term narration refers to any type of story (tale, event, and incident) with a narrator. There are two types of narration: traditional and modern. Concerning characteristics of modern narration (story), its logical structure, and absence of any presumption is noticeable, so that everything is created throughout the story.

The story (modern narration) can be classified based on two features:

1. Objective: entertaining or analytical
2. Volume and magnitude: short story or long story

By definition, the term "tale" refers to works where more emphasis is put on extraordinary events than changes and evolution of characters. Centerpiece in tale is an extraordinary event, which is basis for development of other events, and it is based on chronological order (Ajand 1984, 71). Another distinguishing feature between the tale and the story is that the former features a hero while the latter represents characters.

Both story and tale can be traced back to ancient ages where tales by Egyptian magician were common about four thousand years before Christ. Gilgamesh legend is recorded in 1400bc and Homer wrote his epic about 1000bc.

Studying modern story writing starts with introduction to short story. Bernard Mathews an American critic first coined the term in 19<sup>th</sup> century and distinguished it with the truncated story. The term "Short story" was first coined by the French and some believe in some difference between this type of story and tale. One is difference in form and structure, and another is content. In spite of story, short story is featured with well-constructed cause and effect organization.

According to Shams Langeroudi, the first novel in Farsi is Shams va Tagareh by Mohammad Bagher Khosravi. The work is in three volumes, which narrates a romantic and historical story. On the other hand, Ehsan Abedi introduced "the Story of Old and Young" by Naserdin Shah (there are doubts about the true author of the book, as some believe it was written by Abdolkarim Monshi Tehrani the monarch secretary of the king) as the first novel in Farsi.

### **History of story writing in Iran**

Modern story writing in Iran is greatly influenced by translated novels and short stories from Western culture. A surge in translation was after Mashroute Revolution, which faced with considerable acceptance by middle class of that age before being promoted among the public. Iranian artists first started by

novels, which were under influence of travel accounts, biographies, political diary and translation of romantic and action novels. Their works mainly dealt with social and political underdevelopment of Iran's society with a complementary of criticism of the status quo and education system. Among the pioneer works were "Siahatnameh Ebrahim Beigh or trouble of his zealotry" by Zeinalabedin Maraghei and "Masalek Almohsenin" by Abdolrahim Talbouf. The second wave was historical novel featured with nationalistic attitudes. These works were developed around on honoring historical characters and galvanizing nationalistic emotions. "Shams and Toghra" by Mohammad Bagher Mirza Khosravi, "Betrayals or revenge seekers of Mazdak" by Abdolhosseing Sanatizade Kermani, and "Love and Kingdom or Victories of the Great Cyrus" by Sheikh Mousa Kaboudarahangi. The last wave was romantic novels with social criticisms that targeted social crises and disasters. Novels like "Horrrifying Tehran" by Morteza Moshfegh Kazemi and "Dark Days" by Abbass Khalili are some to name in this wave. Technical faults and being rather a report than a novel were some reasons why these works failed to form a reliable base for Modern Farsi narrative literature. This gave more room for popular novels and short novels and consequently, in spite of general trend of other countries, short story writers such as Mohammad Ali Jamalzadeh, Sadegh Hedayat, and Bozorg Alavi developed modern Farsi narrative literature. (Mirabedini, an essary, 2010)

From historical viewpoint, there are three major stages in Farsi story writing:

1. Initiation and evolution;
2. Development and promotion;
3. Heterogeneity

Initiation and evolution was triggered in 1922 by short stories like "Yeki Bod Yeki Nabod" by Mohammad Ali Jamalzadeh and, it went on by works of Sadegh Hedayat and Bozorg Alavi. Jamalzadeh was the one who introduced short story to Iranian readers and afterward was recognized as father of Farsi story writing by critics. Adventurous and tender structure of short and long stories of Jamalzadeh had profound effect on writers afterward, which was actually an evolution in Iran story writing. Many critics, therefore, believe that Sadegh Hedayat founded modern Farsi story writing. Variety of his works encompasses and creates a wide range of story writing, which affected others in different ways. However, global development of story writing, many innovations, translations of Western outstanding works, and ever-increasing improvement of Iranian authors and their technical knowledge have had undeniable effect on Iranian story writing.

Bozorg Alavi and his stories with defiance theme, after Sadegh Hedayat, also made a great contribution to Iran's story writing. His stories generally were challenging as the author found it vital to fight against dictatorship and thus many of them are feature with realism and criticism. (Mirsadeghi, 2007, 145)

In Post-World War II era, Sadegh Chobak and Ebrahim Golestan followed American authors and made a great contribution in story writing whether in style or in theme and technical features. Sadegh Chobak shows influence of Ernest Hemingway, William Faulkner, and Erickson Kaldoul on his works, where situations and realities are naked and there is no trace of customary euphemism. He successfully revealed the reality of corrupted society and intrinsic needs of the characters.

After September 1941, many authors showed more interest on writing stories. Chobak and Alahmad adopted more colloquial tongue and Ebrahim Golestan and Azin later showed tendency to rhythmic and literary prose. Moreover, Al Ahmad led a trend of story writing that later evolved as leader of political – literary movements. This group of authors was known as “thesis-oriented” authors; they sought an ideology in their work and used their work as medium to transfer their beliefs. Along with Al Ahmad, Azin, Freidon Tonekaboni, Samad Behrang, Ali Ashraf and Darvishan are some others to name. One of the authors of initiation and evolution stage is Simin Daneshvar how was the first female author in narrative literature with “So va Shoun” as her outstanding work. (Mir Sadeghi, 2007, 146)

As the second stage, development and promotion of Farsi story writing was started after the 19<sup>th</sup> of August 1953 coup and continued until Iran's revolution in 1978. The stage was triggered by relative freedom of speech after September 1941, translation of Russian, and American works caused significant evolution in Farsi story writing. The magnitude of the evolution was not clear until the coup of 1953. Some of the authors of previous stage such as Al Ahmad, Golestan, Beazin, and Simin Daneshvar found the chance to publish their master works. This stage also introduced some outstanding characters in narrative literature.

Short story is still an undeniable part of narrative literature, though “Yeklia and His Loneliness” by Taghi Modaresi as a short novel and “Ahou Khanoum Husband” by Ali Mohammad Afghan as a novel are classified in this stage.

There are also some more creditable novels in this stage such as “Ahou Khanoum's Husband”, “Sang Sabour” by Sadegh Chobak, “So va Shoun” by Simin Daneshvar, “Deraznaie Shab” by Jamal Mir Sadeghi, “Neighbors” by Ahmad Mahmoud, “Sharab Khanoum” by Esmaeil Fasih and a short novel by

Hoshang Golshiri “Sahzdeh Ehtejab”, and “Yeklia and His Loneliness” by Taghi Modares.

Thirdly is heterogeneity, which takes its name after emergence of several literary movements; in some cases quite controversial. The faster and faster pace of changes in Iranians' lives after the Revolution formed the perspective of story writing at this age. This stage is featured with considerable growth in works volume especially by women. Generally speaking, there are three groups of story writers:

1. Official authors mainly focused and affected by myths, Hadithes, religious interpretation, and religious narrations along with political issues.

2. Modernist authors who tend to copy extremist quality of modernist masterworks.

3. There is a third group between the extremes of the two groups above who try to find a moderate way. Concerning quality, the major portion of works at this stage belongs to the third group. (Mirsadeghi, 2007, 147)

#### Contemporary Iranian Authors

**Mohammad Ali Jamalzadeh:** by his “Yeki Boud Yeki Naboud” Jamalzadeh opened new path ahead of others, which was unprecedented. He took the first step in modern story writing and this brought honor of being father Iran's modern story writing. The main contribution he made was brining informal and colloquial tongue into the stories. Jamalzadeh adopted a specific style in writing ample with idioms, simile, hints, and proverbs commonly used by the public. (Aryanpour, 1978, 50)

Some of the features of Jamalzadeh works are:

1. Informal tongue; he is rather close to colloquial as used by the public, though his works have a long way to achieve independency, firmness, and flexibility.

This is the opening of “Shekar”:

“you won't find anywhere like Iran where good and bad are sentenced the same. After a 50 years homelessness and hardship, I heard a Gilaki rhyme before I could see Iran's territory from the deck. I was as if they have found a poor grasshopper, they were huddled up around the ship to win one or two passengers to the shore.” (Jamalzadeh 1978, 22)

2. Using idioms and proverbs commonly used by the public: this made a great contribution on popularity of the stories, while there are issues regarding difficulty in understanding: “indeed he is like a beggar, a pet cat or jew businessman how strives to get his money back or as tight as Isfahanies who you may never possibly get rid of.” (the same 111)

Admitting novelty of Jamalzadeh's style, this novelty is not evident in the content and meaning. Many argue that among his works, “Yeki Boud Yeki Naboud” is the only one of any value of a

story, while others are reproduction of previous works or sort of diaries. “Sahraei Mahshar”, “Saro Tah Ye Karbas”, and “Daralmajanin” are some of Jamalzadeh’s works.

**Sadegh Hedayat:** As another main author of contemporary storywriter in Iran, Hedayat made a great contribution in evolution of Farsi Prose. Although, profound effect of society on his work is undeniable, his works do not target specific groups in the society. He tries to show his loath of empty and meaningless traditions and this feature leads his work to be national-biased with stronger concepts, structure, and technique. Hedayat’s works are more popular with more effect on next generation authors. His humanistic and nationalistic approach made a great contribution on his success.

His style is simple and straight, ample with publicly used idioms and proverbs though he keeps balance in using them. He adopts a narrative and well-structured language in harmony with his characters. He successfully mixes Farsi and European styles into an easily understandable language for the public. His language is rooted in folk tales and he has done a great job in nurturing and reproducing the stories that makes his works effective on many other works. Regarding the content, Hedayat’s works may be classified into two groups:

a. Works based on regret of hatred toward government and attention to low class of society, where people under social and economic pressures are at the center. His perspective in this regard is admirable. Haji Baba, Alavie Khanoum, Talab Amorzesh, Patriot are some of the work in this group.

b. The second group of his work mainly expresses the author’s attitudes and his love to Iran, its culture and Iranian customs. In addition, he tries to express his thoughts and desires along with his dreams. Akharin Labkhan, Afrinegah, Dash Akol, Three Drops of Blood, Zende be Gor, Dark Room, and Blind Owl are his works in this group.

Hedayat’s masterwork is the Blind Owl; a mixture of reality and imagination, where the imaginary characters resemble the reality. The story is based on reincarnation where human seeks their lost ones of the previous life. Next generation inherits emotion, rationality, revolutionary attitude, and aesthetic.

Some of Sadegh Hedayat’s works are Three Drops of Blood, Rambler Dog, Chimp that its Master is Dead, First Day of tomb, Last Light, The Rock.

#### **Story writing in Arabic world**

Arabic word is known for its centuries of poems ruling Arabic literature. Amr Alghes the master of poets of under-civilization age, Mtban the great poet of Abbasi era, neoclassic poets like Ahmad Shoghi and Aljawaheir and modernists like Nazar Ghabani, Adonis, Mahmoud Darvis, etc. continued the poem throughout Arabic history. However, poem has found new rival in the new age, which is novel and story. Arab society has introduced international authors such as Najib Mahfouz, Yousef Edris, Ghadetsaman, etc., who managed to break the unrivaled rule of poem in Arabic literature.

Apparently, Mohammad Hosseing Heikal (Egyptian author) triggered story writing in Arabic world in 1914 by his work “Zeynab”. However, Bathine Shaban a researcher and ministry of Syria Refugees recently admitted in his research that “Zina Zeinab Foaz” with her work “Hassan Al Vaghib” is the first Arab story writer. She published her novel in 1998 before Hossein Heikal. The researcher is going to publish his work titled “Arabic Women Authors 1898-2000) by New York Publications. ([www.rahenejatdaily.com](http://www.rahenejatdaily.com))

To achieve better understanding of contemporary Arabic literature we need to go back to the roots of evolutions.

French Emperor Napoleon Bonaparte invaded Egypt in 1797 (Aljandi 1976, pp.3), afterward schools, libraries, and journalism were developed in Egypt and many Egyptian found the chance to learn about scientific development and achievement all around the world. In 1805, Mohammad Ali Pasha sat under thrown in Egypt. He helped development of publication and journalism in Egypt and sent many students to Europe. In general, new style of story writing was triggered by establishment of newspapers such as “Al Vaghaei Al Mesrieh” – founded by Mohammad Ali Pasha in 1828- (Alfakhori, Bit, pp.844). Such measures eventuated in revolution of journalism in Egypt until 1875 when a wide circulation newspaper titled “Alahram” was established by two Lebanese brothers (Salim and Basharath Taghoula). The movement went on by publication of many magazines all with one common feature; to inform people about tyranny and dictatorship. Alhelal published by Jorji Zeidan one the magazines was established in 1892 with its motto “Move Ahead.” Another noticeable change was translation wave in Egypt and other lands ruled by Ottoman Empire. The West and East collision gave Arab authors a chance to express themselves. In other words, journalism helps development of Arabic story writing. Generally speaking, there are two main stage of story writing in Arabic world. First, translation and adoption, which cut story writing from its classic frame. The separation is not perfect yet as the themes

are elements are the same. "Hadis Eisa Bin Hashem" by Almoyelihi is one of the works at this stage, which is a copy of "Maghamat" by Badie Alzaman. The second stage is when the foundation of modern Arabic story is formed through adopting Western style in writing. The Story of Zeinab by Mohammad Hossein Hekal (1888-1957) is one of the pioneer works where we can find matured story elements, while the work is not outstanding by itself.

#### **Arabic Story and Tale**

The two most dominant trends are "historical trend" and "social trend".

Ottoman history abounds with oppression and crime and the main body of society kept underdeveloped for ages. At those ages, journalism turn out to be an effective tool to galvanize the public against tyranny of Ottoman. Tales at this stage are mainly about history. Salim Albastani, Jorji Zeidan, and Farah Antoan are some of the authors at this sage. Salim Albastani wrote training tales full of adventures and extraordinary events (Zenobia Queen and Sargashtehi Belad Sham) and Jorji Zeidan wrote 21 historical tales about Islamic narrations. (Khafaji 1957, pp.30)

A specific social narration is evident in Salim Albastani's work such as "Salmi" and "Asmae" which are based on accident and exaggeration. His characters are completely in service of the story and show no independency. However, traces of social and moral critic are visible here and there. The works by Anthoan Venghoula Hadad (1872-1916) show the same features.

**Arab master storywriters:** 1960s plays a dominant role in contemporary history of the Arab and its sociological effect on social evolution is undeniable. At this decade, all Arabic countries took great steps toward democratic system. In September 1965, they endorsed a charter in Alexandria, Egypt for unity against Israel.

Therefore, Arabic tales' perspective is mainly focused on nature of Arabic society and negligent to external factors – surely effective on structure of Arabic society after invasion of Western powers. In this regard, some politicians such as Seyed Jamaledin Asadabadi and Mohammad Abdeh took some steps. That is why that the main concern of Arabic authors is fighting traditions of their society; some dominant figures like Jabran Khalil Jabran believed that fundamental changes in Arabic society is critical for the movement against tyranny. The same idealistic approaches are evident in the romantic Egyptian author Manflouti.

To put it in another term, there is a paucity of narrative works in Arabic literature before June 1967 (Arabs – Israel war). Results of the war (Arabs were defeated) was a shock to the Arab world and reminded

them that they need to define their status in the world (Farzad 2001, pp. 40-41). Narrative literature continued its path toward development and finally shocked the world of literature when Najib Mahfouz won the Nobel Prize in 1988. The point was the Nobel winner was from a culture with no considerable history in narrative literature and was indebted to Europe for their success in the literature. In other words, Egypt is the home of Arabic novel and Najib Mahfouz is the founder of modern Arabic novel (Aldsoughi, 1997, 190). However, there are differences in novel writing between Iraq, Saudi Arabia, and Egypt, while Lebanon, Syria, Jordan, and African-Arabic country follow Egyptian school. Thanks to publication development, Egypt is pioneer of novel writing among other Arabic countries. In fact, Egyptian newspapers such as Alahram acted as tribune for Arabic novel, while Arabic countries in Persian Gulf region started their work after oil exploration and formation of middle class. At any rate, contemporary Arabic countries all have introduced noticeable authors to the world.

Amin Alrehani a Lebanese author was born in 1876; he was one of the top Lebanese scholars with global thoughts and concerns. He dreamed about concepts such as establishing a united Arabic Empire. He is known as Arabic neo-poet who fought against tyranny, and in spite of Jabran Khalil he was rather realistic and tried to keep his work from romantic and sophistic thoughts. Youth issues, poverty, and underdevelopment of Arabic worlds are the main themes of his works. His stories are, in some cases, criticism and training in some other cases. Almahalefat Alsalsiat, Alrihaniat, and Alghomiat are some of his noticeable works. (Albert Alreyhani, 1987, 34)

Knowing the undeniable role of translation in emergence of Arabic narrative literature, what follows is a brief introduction to translation:

Some believe that translation was mainly aimed to help the Arab society and to let the Arabic Nations have access to literary masterworks. Recent translation trend was started in 1798.

At its early days, there was no evident trend and purpose in translation works. Gaining revenue was the main reason for translation and translated works were in contrary with common Arabic culture. This deprived the authors of that age from a reliable source for training and growing. Gradually, authors criticized the general trend of translation and started to compose domestic stories based on domestic raw materials. However, profound effect of some translators in Arabic literature is undeniable. Michael Naeim says "although it is not easy to devour and analyze the great invasion of Western literature, we are passing the age of dependency with high pace. In addition, we

have learned what is good for us among the options provided by the Western culture as we also know how to manipulate it for better usage.” (Naeimeh, 1998, pp. 4).

### Conclusion

We discussed that geographical vicinity and many common religious, historical, and social features have created considerable ties between Iran and Arabic world. One of these ties is evident in literature.

Similarities of narrative literature of Iran and Arabic world are undeniable; the similarities can also be found from chronological viewpoint. Comparison of narrative literature between Iran and Arabic world showed that in spite of being home to masterworks such as “*Kelile va Demne*” and “*One thousand and one night*,” narrative literature in the region is in its early days and under great effect of the West (Aboheif 2004, 51). Story writing was triggered in both territories after translation of Western works. French literature among other played the dominant role in this regard. One of common features between the two territories is the role of political/social events in leading the literature movements. Mashrouatiat movement and Iran’s Revolution on one side, and Napoleon invasion to Egypt, political/military defeat of Arab nations in June 1967 and 1982, and Resistance movement in Arabic world played undeniable role in evolution of narrative literature in Iran and Arabic world.

Of other common feature between the two nations is the role of journalism and narrative literature rings, which played considerable role in navigating ideologies and styles in narrative literature field.

In summary, it is noticeable that Arabic story and novel movement is on the same path of Arabic literature, while no connection between classic and modern Farsi literature can be found in the last two centuries. One reason is deeper effect of vanguard Western movement on Farsi literature, which has eventuated in a chaos. However, both cultures have showed noticeable growth in narrative literature.

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## Relationship between the dimensions of organizational structure and the dimensions of knowledge management in Tehran government suspended of iran

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**Abstract:** This study evaluates the relation between organizational structure and knowledge management in the Tehran government suspended. Stephen.P.Robbins model is used for measuring organizational dimensions including formality, complexity and focus. Main Elements of knowledge management consist of 3 blocks: knowledge creation, knowledge transfer, knowledge maintenance. The population of this research is all of the Tehran government suspended managers and employees including 60 persons. In this research we used Krejcie & Morgan's table to select the sample size. we carried out a survey by the means of knowledge management questionnaire and standard questionnaire of Robin's structure among this sample. After collecting and analyzing data based on correlation coefficient of Spearman, the results clearly showed that there is a meaningful relation between organizational structure dimensions and knowledge management. In addition, we found out there is a relation between organizational formality and knowledge management. Moreover, there is a relation between organizational focus and knowledge management. The last recognized result was the relation between organizational complexity and knowledge management.

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**Key words:** Organizational Structure, Knowledge Management, Complexity, Formalization, Centralization, Knowledge Creation, Knowledge Transfer, Maintain Knowledge

### 1. Introduction

In spite of the growth and development of knowledge management, many organizations still have experienced the lack or failure of knowledge transfer to the detriment of their operations (Babcock, 2004; KPMG, 2004).

Organizations can be more successful when they facilitate the conditions in which knowledge providers effectively share their knowledge and knowledge recipients effectively acquire and apply that knowledge (Argote & Ingram, 2000; Quigley, Tesluk, Locke, & Bartol, 2007). While there has been extensive research on knowledge transfer from various perspectives, most studies to date have neglected the knowledge recipient perspective, and have instead targeted the knowledge provider perspective such as knowledge contribution and sharing. Thus, there is a critical need to examine how knowledge recipients select their strategies for acquiring the specialized knowledge needed to do their work. According to Muller e Grings (2003), the competitive factor is knowledge and the abilities of people in each organization. Thus, many organizations have realized the importance of easy systematic actions to identifying, developing, sharing, using and holding back knowledge (Paula Michelle purciconio, 2006).

Knowledge creation and knowledge transfer are considered to be two main activities of knowledge management. Creation and transfer of knowledge require

special structure, culture and technology in the organization. Organizational structure represents the manner of organizing people and professions in an organization. Structure may encourage or discourage knowledge management (Asghar Najafitireh shabankareh, 2012 ).

Knowledge management is a new viewpoint for organization which believes that if organizations want to be successful, they must access to knowledge and have a deep understanding of it in all layers. So recognition of knowledge management backgrounds in the organization and implementation of this phenomenon is the first step and the most important issue of this organization. Considering the importance of this issue, the researcher tries to study the relation between organizational structure and knowledge management among the employees and managers of Tehran government suspended of Iran.

### 2. Theoretical fundamentation

#### 2.1. Organizational Structure

**Organizational Dimensions:** Organizations have special characteristics that make them to understandable and comparable. Content dimensions indicate whole organizational and structural dimensions and also state internal characteristics of an organization. They provide a basis for organization which make it measurable and comparable (Queng,M.D,2005).

**Formality:** It tries to set a standard for duties. When the level of formality increases, then description of

specified rules and regulations would be great and clear instructions for job process is available.

**Concentration:** It relates to levels of hierarchy authorities that could make decisions. If the head make most of decisions in organization, organization will be centralized. In decentralized organizations more power is vested in to inferiors and such decisions are made in lower layers.

**Complexity:** The amount of separation which exists in an organization and it is categorized in to 3 categories: horizontal separation, Vertical separation, Geographical separation.

## 2.2. Knowledge management

Knowledge management is a new and controversial term and has many different definitions. The term knowledge management was first introduced in Europe Management Conference in 1986. Alternative definitions have been proposed since that attempt to capture the complexities of knowledge management. The American Productivity and Quality Center defines knowledge management as "the strategies and processes of identifying, capturing and leveraging knowledge"(Atefeh et al 1999, p. 172). Knapp (1998) defined it as the art of transforming information and intellectual assets into enduring value for an organizations clients and its people. Daruch (2003) defines it as the process that creates, share, distribute and use the knowledge in the organization. Different scholars have identified different processes for knowledge management such as:

1. Creation, transfer and application (Spender, 1996)
2. Capture, transfer and application (Delung, 1997)
3. Identification, capture, development, sharing, dissemination, application and storage (Probest et al, 2000).

### **Knowledge creation process**

Knowledge creation process is complex, multidimensional and dynamic. Organizational knowledge creation is the ability of an institute to create knowledge, circulate it in the organization, products, services and systems (Nonaka and Takeushi, 1995). Nonaka (1995), the Hitotsubashi university professor of management in Tokyo believes that successful companies are organizations that are consistently creating and circulating new knowledge in the organization and applying it to new products technology. In fact, he wants to say that knowledge creation must be the centerpiece of the companies' organizational strategies. The knowledge management literature distinguishes between individual and organizational knowledge creation. These differences are important since the knowledge creation process features are different depending on whether the knowledge is individual or organizational. It can be said that social knowledge is the total amount of things people know (Goucher, 2007). Ang and Massingham

(2007) presented a list of factors that affect knowledge creation. They classified these elements into four groups of cultural, organizational, knowledge sources and knowledge processes. Knowledge is created in the spiral that goes through pairs of seemingly antithetical concepts such as order and chaos, micro and macro, part and whole, mind and body, tacit and explicit, self and other, deduction and induction, and creativity and control (Nonaka et al, 2001). In order to understand how organizations create knowledge dynamically, Nonaka and others (2001) have presented a model of knowledge creation consisting of there elements. These three elements have to interact with each other to form the knowledge spiral that creates knowledge.

1. The SECI process the process of knowledge creation via conversion from tacit to explicit knowledge;

2. "Ba" the shared context for knowledge creation;

3. Knowledge assets the inputs, outputs and moderators of the knowledge- creating process.

### **Knowledge storage process**

Alavi (2000) claimed that knowledge creating new knowledge is not enough and mechanisms are needed to store acquired knowledge and to retrieve it when needed. The concept of organizational memory is a great solution in this regard. Organizational memory includes knowledge residing in various component forms that may include written documentation, structured information stored in electronic databases, codified human knowledge stored in expert systems, documented organization procedures and processes, and tacit knowledge acquired by individuals and networks of individuals (Tan et al, 1998). Organizational memory includes individual memory (a person's observation, experiences and actions) as well as shared knowledge and interactions, organizational culture, transformations, structure (formal organizational roles), ecology (physical work setting) and information archives (inside and outside of the organization) (Walsh and Ungson, 1991). Organizations which like their knowledge to be accessible in the future must at least have a great command of three basic knowledge management processes. On the one hand, they have to choose events, people and processes which are worthy of storing. On the other hand, they must be able to store their experience in an appropriate form. Finally, they have to guarantee their up-to-date organizational memory. Furthermore, they should develop security technologies to limit the accessibility of their knowledge. The following activities are necessary for protecting knowledge: knowledge protection against inappropriate use or being leaked in inside or outside of the organization, limited accessibility to some of the knowledge sources of knowledge by password technology, identifying restricted knowledge easily, tacit knowledge protection and most importantly,

communicating the importance of knowledge protection on a corporate level (Probast et al, 2000).

Markwart (2002) believes that a knowledge storage system must have the following factors:

1. A structure which allows the system to present the information quickly and correctly.
2. Classification of (information) events, policies or procedures based on learning needs.
3. the ability to present information precisely and clearly
4. an on time, precise and available content

**Knowledge dissemination(Transfer) process**

Alavi and Leadner (2001) define knowledge dissemination as the process of transfer knowledge through out the organization. Knowledge dissemination process can happen between individuals, groups or organizations using any type or number of communication channels. Similarly, Gupta and Govindarjan (2000) equating knowledge sharing to knowledge flows theorize that knowledge flows comprise of five elements: value of the source knowledge, willingness of the source to share knowledge, media richness of the communication channel, willingness of the recipient to acquire knowledge and the absorptive capacity of the recipient. Davenport and Prusak (1998) define knowledge sharing as a process of knowledge exchange between individuals and groups. Connelly and Kelloway (2003) define knowledge sharing as a set of behaviors that involve the exchange of information or assistance to other. They are number of factors that influence knowledge sharing behaviors of individuals. They range from hard issues such as tools and technologies to soft issues such as motivations and provision of incentives to encourage knowledge sharing, organizational culture, personal values and self-identities, national culture, trust, care organizational resources like time and space and access to knowledgeable people in the organization (Chennamaneni, 2006). Another group of researchers believes that the most important elements that affect knowledge sharing are organizational infrastructure and human resources management. Organizational infrastructures include organizational culture, organizational structure, rules and information technology (Yi, 2005). Knowledge dissemination is

defined as knowledge exchange management in the organization for encouraging innovation; increasing the awareness of great past procedures and making users adopt better procedures for their future decision-making. The personnel degree of participation in knowledge dissemination affects new products quality (Yang, 2008). Markwart (2002) points to two voluntary and involuntary approaches with regards to knowledge exchange. The voluntary methods may be done in different ways. The written method includes individual communications such as notes, reports, bulletins and also publications. National conferences, article abstracts, teacher-student training, foreign consultants or official courses participation provide more opportunities for exchanging knowledge. Changing personnel's position and posts can be planned for knowledge dissemination in the organization. Knowledge can also be involuntarily exchanged through stories and myth, permanent work force and unofficial networks. The less the voluntary or planned knowledge exchange is, the more loss in the potential knowledge would be.

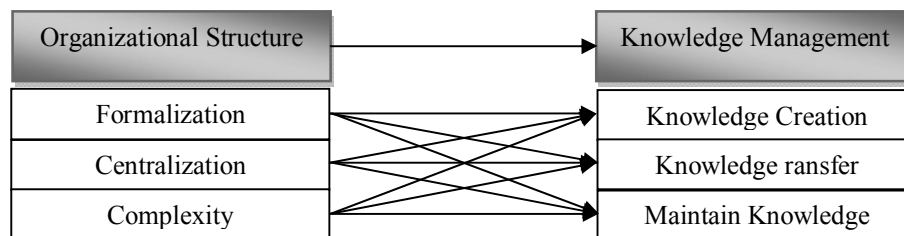
**3. Materials AND Methods**

The objective of this research is to identify and study the Relationship between the dimensions of organizational structure and the dimensions of knowledge management. This research is a case study on Tehran government suspended of iran, following hypotheses were proposed:

**Main hypothesis:** There is a relationship between the dimensions of organizational structure and the dimensions of knowledge management in Tehran government suspended.

**Secondary hypotheses:**

- There is a relationship between the Formalization and the Knowledge Creation in Tehran government suspended.
- There is a relationship between the Formalization and the Knowledge Transfer in Tehran government suspended.
- There is a relationship between the Formalization and the maintain Knowledge in Tehran government suspended.



**Fig. 1 Conceptual model of the research**



- There is a relationship between the Complexity and the Knowledge Creation in Tehran government suspended.
- There is a relationship between the Complexity and the Knowledge Transfer in Tehran government suspended.
- There is a relationship between the Complexity and the Maintain knowledge in Tehran government suspended.
- There is a relationship between the Centralization and the Knowledge Creation in Tehran government suspended.
- There is a relationship between the Centralization and the Knowledge Transfer in Tehran government suspended.
- There is a relationship between the Centralization and the Maintain knowledge in Tehran government suspended.

In order to confirm or reject the hypotheses, the collected data from the theoretical foundations and the questionnaires are analyzed through standard statistical methods and technics. To have a quicker access to the opinion of the participants in the research, we used the method of data collecting by the questionnaire. The content validity of these questionnaires was confirmed by officers of management faculty of university of Tehran and their reliabilities were obtained by Krunbakh Alpha again (KM=0/95 and organizational structure=0/9). Additionally, to specify the validity of the questionnaire we used judgmental method the research statistical population of the research contained all managers and employees of in Tehran government suspended. including 60 persons. In this research we used Krejcie & Morgan's table to select the sample size.

Finally 50 questionnaires were returned and analyzed Results were optioned by SPSS in tow levels of descriptive (internal tendency, variability, frequency) and inferential (spearman correlation) Statistics.

**4. Findings of the research:**

The descriptive data of the research show that approximately 26% of the participants in the statistical sample are female and the remaining 74% are male. Almost 26% of the participants had between 0 to 5 years of work experience, and 20% of the participants had between 6 to 10 years of work experience, 16% of the participants had between 11 to 15 years of work experience, 20% of the participants had between 16 to 20 years of work experience, 14% of the participants had between 21 to 25 years of work experience, 4% of the participants had between 26 to 30 years of work experience.

Additionally, almost 16% of the participants had a diploma degree, almost 42% of the participants had a associate degree, almost 26% of the participants had a bachelor degree, and the remaining 16% of the participants had master's degree or higher.

We used correlation test to determine the relationship between Organizational Structure and Knowledge management. Since the variable of the research are qualitative in nature, thus the Spearman correlation test was the base for calculations. The results of the findings are as follow:

- **First hypotheses:** There is a relationship between the Formalizational and Knowledge Creation in Tehran government suspended.

**Table 1. Results for the first hypotheses**

		Knowledge Creation
<b>Formalization</b>	Spearman's Correlation coefficient	-0.477
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.000 and less than 0.05, we can conclude that there is a relationship between the Formalizational and the Knowledge Creation in Tehran government suspended. The intensity of this relationship is equal to -0.477 regarding the obtained Spearman's correlation coefficient.

- **Second hypotheses:** There is a relationship between the Formalizational and Knowledge Transfer in Tehran government suspended.

**Table 2. Results for the first hypotheses**

		Knowledge Transfer
<b>Formalizational</b>	Spearman's Correlation coefficient	-0.633
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.000 and less than 0.05, we can conclude that there is a relationship between the Formalizational and the Knowledge Transfer in Tehran government suspended. The intensity of this relationship is equal to -0.633 regarding the obtained Spearman's correlation coefficient.

- **Third hypotheses:** There is a relationship between the Formalizational and maintain Knowledge in Tehran government suspended.

**Table 3. Results for the first hypotheses**

		maintain Knowledge
Formalizational	Spearman's Correlation coefficient	-0.535
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.000 and less than 0.05, we can conclude that there is a relationship between the Formalizational and the maintain Knowledge in Tehran government suspended. The intensity of this relationship is equal to -0.535 regarding the obtained Spearman's correlation coefficient.

- **Fourth hypotheses:** There is a relationship between the Complexity and Knowledge Creation in Tehran government suspended.

**Table 4. Results for the first hypotheses**

		Knowledge Creation
Complexity	Spearman's Correlation coefficient	0.362
	Sig. value	0.005
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.005 and less than 0.05, we can conclude that there is a relationship between the Complexity and Knowledge Creation in Tehran government suspended. The intensity of this relationship is equal to 0.362 regarding the obtained Spearman's correlation coefficient.

- **Fifth hypotheses:** There is a relationship between the Complexity and Knowledge Transfer in Tehran government suspended.

**Table 5. Results for the first hypotheses**

		Knowledge Transfer
Complexity	Spearman's Correlation coefficient	0.418
	Sig. value	0.001
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.001 and less than 0.05, we can conclude that there is a relationship between the Complexity and Knowledge Transfer in Tehran government suspended. The intensity of this relationship is equal to 0.418 regarding the obtained Spearman's correlation coefficient.

- **Sixth hypotheses:** There is a relationship between the Complexity and Miantain Knowledge in Tehran government suspended.

**Table 6. Results for the first hypotheses**

		maintain Knowledge
Complexity	Spearman's Correlation coefficient	0.315
	Sig. value	0.013
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.013 and less than 0.05, we can conclude that there is a relationship between the Complexity and Miantain Knowledge in Tehran government suspended. The intensity of this relationship is equal to 0.315 regarding the obtained Spearman's correlation coefficient.

- **Seventh hypotheses:** There is a relationship between the Centralization and Knowledge Creation in Tehran government suspended.

**Table 7. Results for the first hypotheses**

		Knowledge Creation
Centralization	Spearman's Correlation coefficient	-0.525
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.00 and less than 0.05, we can conclude that there is a relationship between the Centralization and Knowledge Creation in Tehran government suspended. The intensity of this relationship is equal to -0.525 regarding the obtained Spearman's correlation coefficient.

- **Eighth hypotheses:** There is a relationship between the Centralization and Knowledge Transfer in Tehran government suspended.

**Table 8. Results for the first hypotheses**

		Knowledge Transfer
Centralization	Spearman's Correlation coefficient	-0.658
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.00 and less than 0.05, we can conclude that there is a relationship between the Centralization and Knowledge Transfer in Tehran government suspended. The intensity of this relationship is equal to -0.658 regarding the obtained Spearman's correlation coefficient.

- **ninth hypotheses:** There is a relationship between the Centralization and Maintain Knowledge in Tehran government suspended.

**Table 9. Results for the first hypotheses**

		<b>maintain Knowledge</b>
<b>Centralization</b>	Spearman's coefficient	-0.619
	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.00 and less than 0.05, we can conclude that there is a relationship between the Centralization and Maintain Knowledge in Tehran government suspended. The intensity of this relationship is equal to -0.619 regarding the obtained Spearman's correlation coefficient.

- **Main hypotheses:** There is a relationship between the dimensions of organizational structure and the dimensions of knowledge management in Tehran government suspended.

**Table 10. Results for the first hypotheses**

		<b>dimensions of knowledge management</b>
<b>dimensions organizational structure</b>	Sig. value	0.00
	Number	50

Regarding the obtain value of Sig. from the Spearman's correlation test that is equal to 0.00 and less than 0.05, we can conclude that there is a relationship between the dimensions of organizational structure and the dimensions of knowledge management in Tehran government suspended.

**5. Conclusion and suggestions**

The obtained results of the analysis of the hypotheses are presented in table 11 with regard to the findings of the research. Then some suggestions will be offered on the basis of these findings.

**We conclude that:**

There is a meaningful and inverse relation between formality and Knowledge Management(Knowledge Creation, knowledge transfer, maintain Knowledge) among Tehran government suspended employees, which means that the high level of formality is correlated to the low level of knowledge Management and vice versa. Implementation of knowledge management with the rules and regulations and decisions related to labor relations. Flexibility and less emphasis on work rules lead to better ways of doing things, exchange ideas and experiences and thus to create, transmission and the preservation of Knowledge.

There is a meaningful and inverse relation between Centralization and Knowledge Management (Knowledge Creation, knowledge transfer, maintain Knowledge) among Tehran government suspended employees, which means that the high level of Centralization is correlated to the low level of knowledge Management and vice versa. Implementation of knowledge management in organizations is associated with decision-making authority. So one of the facilitators of the process, lack of concentration and decentralization of decision-making authority.

**Table 11. Results of the data analysis**

<b>Ro</b>	<b>hypotheses</b>	<b>Sig. value</b>	<b>Confirm or deny</b>	<b>Spearman's Correlation coefficient</b>	<b>Type of Relationship</b>
1	There is a relationship between the Formalizational and Knowledge Creation in Tehran government suspended.	0.000	confirm	-0.477	Inverse
2	There is a relationship between the Formalizational and Knowledge Transfer in Tehran government suspended.	0.000	confirm	-0.633	Inverse
3	There is a relationship between the Formalizational and maintain Knowledge in Tehran government suspended.	0.000	confirm	-0.535	Inverse
4	There is a relationship between the Complexity and Knowledge Creation in Tehran government suspended.	0.005	confirm	0.362	Direct
5	There is a relationship between the Complexity and Knowledge Transfer in Tehran government suspended.	0.001	confirm	0.418	Direct
6	There is a relationship between the Complexity and Miantain Knowledge in Tehran government suspended.	0.013	confirm	0.315	Direct
7	There is a relationship between the Centralization and Knowledge Creation in Tehran government suspended.	0.000	confirm	-0.525	Inverse
8	There is a relationship between the Centralization and Knowledge Transfer in Tehran government suspended.	0.000	confirm	-0.658	Inverse
9	There is a relationship between the Centralization and Maintain Knowledge in Tehran government suspended.	0.000	confirm	-0.619	Inverse
10	There is a relationship between the dimensions of organizational structure and the dimensions of knowledge management in Tehran government suspended.	0.000	confirm	-----	-----

The authorities can design and make recommendations system and employee participation in a comprehensive feedback system for idea generation,

transmission and preservation of the experience it provides to the organization.

There is a meaningful and direct relation between Complexity and Knowledge Management(Knowledge

Creation, knowledge transfer, maintain Knowledge) among Tehran government suspended employees, which means that the high level of Complexity is correlated to the high level of knowledge Management. Implementing Knowledge Management division of labor, job titles, various parts of the organization, there are different levels in the organizational hierarchy of authority and distribution of different sectors in different parts of the organization are linked. Authorities to take advantage of the knowledge management, Should act in such a way that the structure of the organization to facilitate smooth flow of knowledge. In order to make use of Organizational structure with low centralization and formalizational and high Complexity

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11/19/2012

## The phenomenon of Information Technology and Enterprise Architecture of Electronics City

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**Abstract:** Today, information technology as an emerging phenomenon has a special place in the world. Expansion of information and communication technology causes changes in many different fields, including the electronic city, municipalities and citizens. Electronic city and municipality require basic enterprise architecture. Enterprise Architecture is designed as a process based on the optimal architecture of electronics city. In order to develop electronic city, we should use enterprise architecture maturity. Therefore, one of the important needs of organizations is the choice of activities according to the existing constraints. The studies show that there is a close relation between information technology, enterprise architecture and the electronic city. The purpose of this research is to explain the concept of information technology, enterprise architecture and electronics city and what relationship they have with together. Do information technology, enterprise architecture and electronic city require each other? [Zeynali Azim Ali, Behnoud Elnaz. **The phenomenon of Information Technology and Enterprise Architecture of Electronics City.** *Life Sci J* 2012;9(4):4228-4234]. (ISSN: 1097-8135). <http://www.lifesciencesite.com>. 631

**Keywords:** Information Technology, Enterprise Architecture, Electronics City, Enterprise Architecture Maturity Model

### 1. Introduction

Undoubtedly, today information technology has created developments in all humanity social and economic areas and its impact on societies is so much that today's world is becoming from a traditional and industrial society to an informational society so fast. The term information technology or information and communication technology has found its global position in two last decades as an innovative, emerging and powerful. It seems that the various applications of information technology will affect all the daily affairs of the communities directly or indirectly soon. Influence and development speed of this phenomenon is so much so than now expected to make enormous changes in social structures that one of these developments is to create electronic city and its architecture. [1]

In fact, electronic city is the electronic and virtual model of activities in a city with the same relations and functions and same complexity of issues in it. It is necessary to use architecture in order to design an efficient electronic city. The architecture of an electronic city is a high level of abstraction that in result of it, useful analysis of the characteristics and properties of various parts of the electronic city is possible. [2] The architecture in the area of information technology, known as enterprise architecture. Today, the impact of the enterprise architecture is much so that not to use it considers as a sign of the inability of organizations to optimize management of information technology. Enterprise Architecture is a macro attitude to the organization's mission and functions, work processes, data entities, communication networks, hierarchies and order of doing tasks in an organization in order to

creating an integrated and efficient information systems. [3] To make enterprise architecture more successfully, the certain framework should be used. Therefore, framework considers as the most important part of enterprise architecture. The appropriate framework selection is one step of the architectural project. Zachman framework that is like "Mendeleev table" for enterprise architecture has a two-dimensional structure which considers six aspects of data include process; place, individuals, time and motivation from five viewpoints include programmer, organization owner, designer, builder and contractor. Zachman framework is so important because most of the enterprise architecture frameworks which have introduced since providing Zachman framework in 1993 use it and many concepts have been used in this context. Hence, zachman framework plays prominent role in essays and research literature as mother framework. [4,5]

### 2. What is information technology?

Speed and productivity of science in the world and new methods of information gathering and distribution on one hand and human increasing need to use different aspects of information on the other hand, led to emerge special social period named information age. The consequence of such developments led to emerge new form of technology known as information technology. [6] Living in a society based on information technology has three basic features:

- a) Shorter distances
- b) Flow of information as the main artery of life
- c) Converting information to product [7]

The affecting speed and development of this phenomenon is so much so that now expected that

fundamental changes occur in the cultural, economic, social and political structures and traditional foundations of society governance and new management system will have been introduced. Information and communication technology and its applications in the world was so affective so that world leaders formed the basis of information society by holding two major meetings (in Geneva and Tunis in 2003 and 2005 AD) and prepared themselves for further changes by providing proper and scientific programs for the global information society. More developed countries (that have acceptor systems to confront with new technology) accepted potential benefits and risks of information and communication technology and use it. Some developing or poor countries which don't have enough information about benefits and opportunities of this technology or necessary economic facilities to utilize this phenomenon, couldn't progress in this area. There are countries don't have financial problems, but they consider this emerging phenomenon ideologically and cause delay and prevent their people to use it. Unfortunately, this approach cause irreparable damage imposed to the society. [1]

Therefore, information technology is a branch of technology for study, designing, development, implementation, support and manage computer-based information systems, particularly software hardware computer applications as well as quick access to information and doing routines regardless geographical distances and time limitation.

Compared to other technologies, information technology also has the following features:

- The ingredient is information or mind raw material
- It can improve by computers
- The final product is an abstract product
- It doesn't have location restrictions
- It doesn't have devastating impact on environment
- It uses hardware technologies to create powerful and fast processors to do computer complex computation. [8]

Information technology has changed the way of working people and state organizations and also has changed the economic and social affairs, and even the way people think. Therefore, information technology plays a significant role in citizens' life. Finally, information technology in the widest sense, includes all aspects of computer technology and as an academic discipline, provides issues of user protecting and its needs in an organizational and societal context through the selection, creation, implementation, integration and management. [9]

### 3. Enterprise architecture

In the middle of 1980, John Zachman, the Consultant business plan, developed in the Zachman Framework, which is designed to serve as a blueprint, or architecture, to facilitate the integration of IT systems. The "enterprise," for which architecture is created, refers to "The one area and the mission of the organization or rather than transcends organizational boundary (e.g. financial management, homeland security)" represents the architecture of the "big picture" view of how the enterprise operates and offers his services. Enterprise architecture (EA) serves as the blueprint of the business operations of the organization, and knowledge and technology necessary to carry these operations, both currently and prospectively. Back to you Why not be published tool. It is to comprehend it to be scalable and to the nature of the increase of the future needs. EA represents the business of design-driven approach to management that emphasizes interoperability and data sharing [10].

So enterprise architecture (EA) is a full expression of the company, a Master Plan "acts as a cooperative force" between aspects of planning activities, such as goals, visions, strategies and governance principles, aspects of the business such as business terms, the organizational structures, tasks, activities and information aspects of automation such as information systems and databases, and the technological infrastructure of the business such as computers, operating systems and systems networks.

In a large modern enterprise, a rigorously defined EA framework may require vision capable of acquiring "whole company" in all its dimensions and complexity. Enterprise Architecture (EA) program supported by a framework and approach that is able to coordinate many facets that make up the fundamental essence of a business in a holistic approach [11]

Architecture is usually divided into different types of architecture or enterprise or ownership. For Aerts et al. (2004) identify three domains of architecture, in which she replied: [12]

- Business architecture defines the nature of its business environment.
- The information system architecture (IT Architecture) details the information system components and business interaction.
- Your platform architecture (or architecture) architecture is the kind of resource that was being done to lay a platform for the construction and operation of systems in the enterprise. [13]

Enterprise architecture definition has changed and evolved in recent years. America electronic government law in 2002 explained the following meaning for enterprise architecture:

- A database of strategic information that will determine the mission

- Information that is necessary to accomplish the mission
- Technologies that are needed to accomplish the mission
- Transitional processes for implementing new technologies in response to changing needs and include three key parts:
  - a) Current architecture
  - b) Optimal architecture
  - c) A transitional program [14]

Two parts of enterprise architecture are management and description method.

- a) Management plan is in line with the following:
  - To converge resources include two subjects (resources planning and standards certainty)
  - Standardization policies include resource integration at the state level
  - support of decision making include financial control and configuration management
  - Avoid of making resources useless include getting help of life cycle for development and management
- b) The description method is in line with following:
  - Enterprise Architecture approach includes an framework of models and methodology of applying architecture
  - The current architecture includes a look at the status quo, strategy, processes and resources
  - The optimal architecture includes a look at the status quo, strategy, processes and resources
  - Architecture management program, including a plan for transition from the current situation to the desired situation [15]

A copy follow the way of organization to the enterprise architecture program matures, and lays benchmarks to measure performance and the way is a natural progression in the development of enterprise architecture. It is found in the Tool-Kit provides guidance for the development process.

In the following, each step begins in the writer of Enterprise Architecture Model is defined. Each step contains statements that are indicative of the degree to which the EA here. This statement of Enterprise Architecture has been organized in the following categories:

- Administration - the government and Responsibilities
- Council - EA program road map and implementation plan
- Framework - the processes and templates for Enterprise Architecture
- Blueprint - collection of the actual standards and specifications
- Communication-education and distribution of EA and Blueprint detail
- Compliance - adherence to published standards, processes and other EA elements, and process and from the track to the proof of the signs of hypochondria, the Integration - touch-points of management processes to the EA
- Involvement - the support you through the organization of the EA. [16]

Enterprise architecture maturity assessment models mainly include six maturity stages and in each stage provide criteria for evaluation of architecture and organization project that according to these criteria, the current maturity level of organization has been identified and are planning to upgrade to the desired level. In general, implementation of IT for maturity models is not the main goal but they are tools for assessment. [17] Enterprise Architecture Maturity Assessment goals include increasing awareness, identifying weaknesses; identify priorities for improvement etc. [18]

The important and valid frameworks of enterprise architecture maturity are [19] (2002) EAMMF, EAMM (2003) [20], E2AMM (2004) [21], OMB (2005) [22], GARTNER (2005) [23], Oregon State of (2007) [24]. Each of these frameworks using certain indicators measures the maturity level of enterprise architecture. [25]

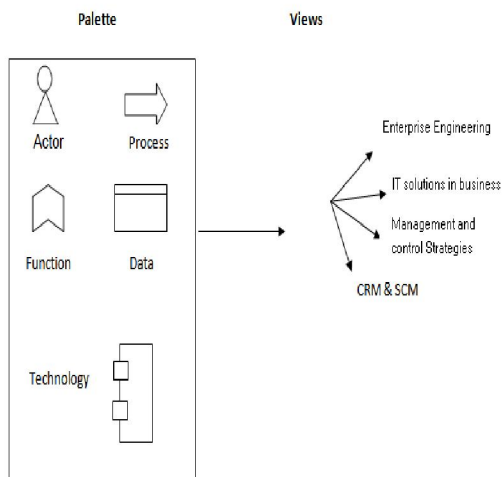


Figure 1: Enterprise Architecture

### 3.1. Enterprise Architecture Maturity Model

Table 1: Characteristics of Assessment Framework of Enterprise Architecture Maturity Model

Framework name	Provided by	indicators
EAMMF (Enterprise Architecture of Maturity Model Framework)	GAO Five levels	1- Showing commitment to perform activities and tasks 2- Opportunity to accomplish activities 3- Confirming activities and tasks by products and following results 4- Survey of successful and satisfactory completion of activities by measuring quantity and quality
EAMM (Enterprise Architecture of Maturity Model)	NASCIO Six levels	1- Rules and Regulations 2 - Planning 3 - Framework 4- Business Plan 5- Communications 6-implementation 7 - Integration 8 - cooperation (synergy)
E2AMM (extended enterprise architecture maturity assessment)	IFEAD Six levels	1- Mutual influences business strategy and information technology strategy 2- Extensive Organizational participation 3- Executive management participation 4- Commercial units participation 5- A department for extensive enterprise architecture planning 6- Development (implementation ) of extensive enterprise architecture 7- Results of extensive enterprise architecture Strategic monitoring 8- Organization program management 9- extended enterprise architecture 10- budgeting and purchase strategy of organization
Maturity assessment model of Enterprise Architecture to governance management and budgeting (OMB)	OMB Six levels	1- change (oriented architecture strategy - strategic orientation) 2- integration (ability to work together - data -business logic- interface) 3- Convergence (components - technical platform - Performance - Security) 4- Convergence of business (strategic goals - and business goals)
Maturity assessment enterprise architecture framework GARTNER	GARTNER	1- Scope and Capability of Enterprise Architecture 2- Support and participate in board 3- The process of defining enterprise architecture 4- Business concepts 5- Enterprise Architecture Concepts 6- Defining desired situation 7- Enterprise Architecture team 8- Effects of enterprise Architecture
State Enterprise Architecture Maturity Assessment Model Oregon	State of Oregon Five levels	Gartner indicators have been used and several sub-indexes are considered for each one.

#### 4. Electronic city

One of concepts has been studied widespread in advanced societies in recent decades and has been implemented successfully in some countries is electronics city. The term "electronic city" was proposed in 1994 and in a conference about Digital city. This program administered in 1996 in some European cities like Helsinki and Amsterdam. Electronic City that is along with the development of information technologies in different countries enters to the social and economic in recent decades is the use of information and communication technologies in order to provide municipal services, timely and directly to citizens 24 hours a day, 7 days a week. Electronic City provides facilities to relevant access to urban information and services and wider opportunities for people to participate in the processes. There are many definitions of electronic city. In other words, in an electronic city all services needed by citizens are met through a computer network. According to this definition, we can say that definition of electronic city is a relative concept in the sense that the greater number of computer services be provided, electronic city be established better. [26] "Electronic City is a city where the opportunities created by Information and Communication Technology in order to increase success and effectiveness of the investment." Odendaal said.

Electronic city will make easy participate in local government, improvement of local service and

increase of operational and administrative efficiency. [28] This city is a proper environment for living, leisure, work and effort. People in electronic cities have more time for leisure and rest and economic growth and productivity in this kind of cities is more that current traditional cities. There are many jobs available in electronic cities and solving the unemployment problem through electronic cities is clear. [29] Creating electronic city will have many effects on economic, social, cultural and political contexts for the city. In economic context, e-commerce development, e-banking and commercial relationships with neighboring countries and other parts of the world are some of its effects. Providing timely services to citizens increases their satisfaction in the use of public and private services and provides making timely groups and communities as well as timely voting and fairly distribution of facilities. Using citizens' opinions in city management is among social effects of electronic city project implementation. In cultural context, electronic city implementation has many effects that, for example, transparency, informing, virtual training for citizens in general and specific areas, publishing digital medias for citizens, publishing news and information timely and many other cultural effects can be named. [30, 31]

##### 4.1. Main axes of electronic city

Electronic city has been made up of many parts which their conscious and bilateral relationships



lead to the formation of a virtual environment for electronic life. These parts and axes are:

a. Electronic life: developing electronic cities may lead to a new style of life for people and electronic citizens which include parts such as electronic education, electronic amusement, electronic communication and electronic.

b. Electronic organization: IT makes globalization possible for companies and organizations. We can have: electronic business, electronic supplies, organizations programming system, and managing customer's relationship.

c. Electronic government: includes four basic aspects of: government and people, government and private section, government and employees, government and other sections. Electronic government is a method for states to use new Technology that provides facilities in order to have access to information, government services, improving their qualities and providing opportunities in order to take part in some events. In fact there is no definite way of describing Electronic government and this may be because of dynamic and versatile technology. The purpose of IT and communication is improving efficiency, impression, clarity of information and exchanging money and information inter and intra states and organizations, government and citizens, government and private section of electronic government.

d. Electronic Infrastructure: Provides the required ground for IT.

Electronic Infrastructure can be divided into three subcategories:

- Laws and regulations
- Human power
- Cultural and environmental situation of IT infrastructure. (32)

The relationship between different sections is shown in the following diagram:

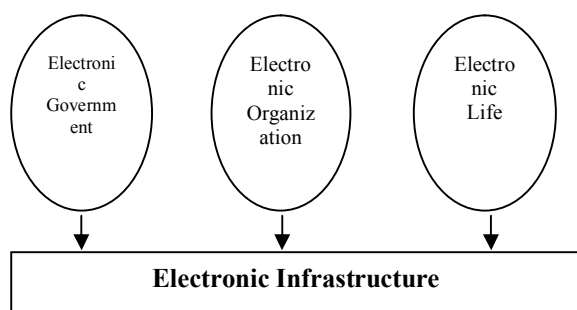


Figure 2 - Conceptual Model of Electronic City

### 5. Electronic City Architecture

Electronics City as a structure for electronic services to citizens can be divided into four main layers (figure 3). These layers include stakeholders, service channels, electronic services, systems and

servers (platforms). Electronics City stakeholders can include all citizens, urban organizations, merchants and traders, factories, industries, and finally the government and government agencies. Different browsers, kiosks, electronic-telecommunications systems and tools can be considered among of service providing channels. Electronic city services include wide range services such as electronic banking, electronic insurance, electronic transportation, electronic health, electronic education and etc. Systems and platforms that provide electronic city services are in last layer. On one hand, these systems are distributed in different organizations and places and each one is designed according to special technologies and on the other hand, has interaction and cooperation ability to work with other systems. [33]

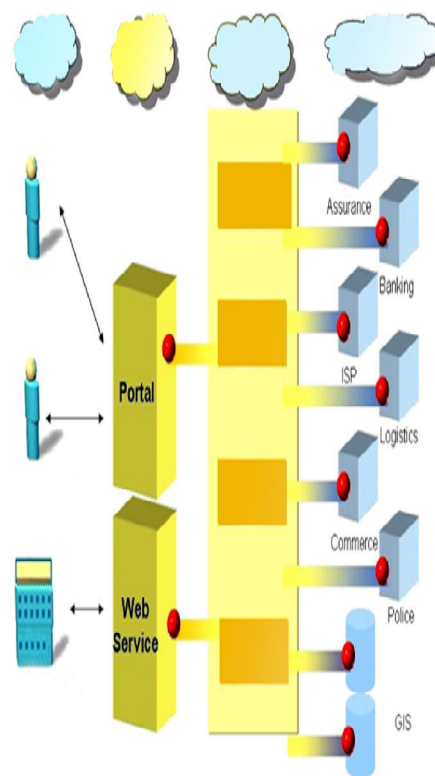


Figure 3- Layers of electronic city architecture

### 6. Conclusion

Today, the city is too vast and urban and social relations have been too complex. Also, we live in an age which is known as the information age. The most important indicator of information age is information technology, that along with it phenomena such as electronic government, electronic city and electronic municipal have emerged. Information technology requires and important and accurate architecture in order to provide its services to the government and

electronic city and municipality and that enterprise architecture element is presented by Zachman in 1980s. In this regard, electronic cities like physical cities are need architecture and planning. Enterprise architecture is also used for electronic city architecture. We have used enterprise architecture layers that include stakeholders, service providing channels, electronic services, systems and servers (platforms) to clarify exact meaning of electronic city. In order to electronic city architecture done correctly, citizens and government personnel and administrative bodies should train to use information technology to meet their own needs and be skillful to provide services to others. Service channels also need to be carefully designed in order to have a trouble-free servicing. A small problem in each layer will be impaired all the system. So, we should use an architecture called enterprise architecture. Finally, based on our own research and others research we concluded that there is a closely relation between information technology, enterprise architecture and electronics city and each one of these elements needs other elements.

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**The investigation of the mass media role in females trending towards general and competitive sports training**

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**Abstract:** The purpose of this research is the investigation of the Mass Medias role on females trending towards general and competitive sports training. Statistical population of this research included East Azarbaijan managers working in physical education department of East Azarbaijan universities. 250 subjects were selected by multiple-stage sampling and were placed in four groups According to analytic nature of the research, after examining of validity and reliability of standard questionnaire, the data were collected through field method by using a standard questionnaire ( $\alpha=0.82$ ). Coefficient correlation and Kruskal Wallis test were used to compare the differences using SPSS coefficient software version 20. The results of the research showed that the Mass Medias play important role in altering female tendency towards general sports training. However, there is not significant relationship between aims of physical education and Mass Medias' aims.

[Amir Ghiami Rad, Esmail Moharami Aghdam, Jafar Barghi Moghadam, Asgar Zolfagari, Mir Hamid Salehian. **The investigation of the mass media role in females trending towards general and competitive sports training.** *Life Sci J* 2012;9(4):4235-4239]. (ISSN: 1097-8135). <http://www.lifesciencesite.com>. 632

**Key words:** Public press, general sports training, competitive activities, athletic females, non-trained females

**Introduction**

The decrease of agility and physical activity in daily life due to the development of facilities and modern life styles has been forced some necessary planning in the field of providing essential movements needed for our body through achieving sport activities and continues physical movements.(1). The championship and public sports are those activities that are very effective in providing humans spiritual and physical health (3). The importance of sport and physical activities is that participants actively become involved in the completion of physical activities, particularly the whole participants are very interested in fulfilling these kinds of sport affairs approaching to their own health, happiness and fitness preventing any diseases in their regard as the main purpose of subjects championship and athletes honorable issues in public sports (4). In the third world countries, woman mostly suffer from the movement shortages than men. Hence, regular and continuous physical activities as well as correct food regimen can optimize women's health preventing many diseases and mortality in this regard (5). These diseases often including Cardia, hypertension, strokes and chest diseases which have been considered as the one third mortality and morbidity of women in the world. So, the cardiovascular diseases and chest cancer lead to the half mortality of women higher 50 years old in developing countries. The diabetic has been affected more than 70 million women worldwide (2). Today, policy makers suggest healthy approaches and prognosis or prevention of disease to stop any

involvement of foreign currency out of the country. In one hand, advertisements play key role in development or undevelopment of social phenomena. Mass media as a branch of advertisement is a connective bridge between people and community requiring the whole assistance of mass media such as TV, papers, radio, and advertismental campaigns. The research results of Charlne (2007) showed that mass media impact on 87% of people consciousness efficiently. These mass media are important factors in the formation of people knowledge and community metal affairs. In the other hand, it organizes people's behavior leading them to behave consciously in the field of social affairs as well (14). Ghafouri et al (2007) stated that the media particularly TV, play essential role in the process of sport but this impact is not organized to community requirements. Due to the sport economy at championship level, these mass media have more tendencies towards the process while the results indicated that in the recent years people are interested following recreational activities (7). According to the increasing role of mass media in development of sport activities in both public and championship levels, the researchers of the present study tended to evaluate the performance of these mass media in terms of economical, social and cultural affairs between 2006-2010. They have also assessed the role of mass media in women tendency towards public and championship sports from the sport expert's perspective in East- Azarbaijan province.

**Materials and Methods****The community and sample of the research:**

The present research is an analysis-based research. The statistical community of the research is including the whole members of college's scientific board and the provincial physical training colleges, sport experts of physical training department and its confirmed sport clubs, TV and radio (broad casting) and the press department of East-Azarbaijan. According to the obtained confirmations from the universities, physical training offices, broadcasting department and the provincial press office and particularly in the field of the present sport experts, the member of statistical community was about 687 ones. To select the related samples of research, the strati form method was used in this regard. In order to estimate the sample's volume, Cochran maximum formula was also used which the number of the samples was estimated 250 by using the same mentioned formula as well.

### Research tool

The data of the research as an arena-based form using questionnaires were standard-based questions which have been also used in some foreign researches and one domestic study. However, to measure the authenticity of the related questionnaire, the most experienced college professors were hired but to evaluate the same questionnaire's reliability, the Cronbach  $\alpha$  coefficient ( $\alpha=0.89$ ) was used. Then, the questionnaires were sent to the subjects.

### Data analysis

The Spss software was used to analysis the related data. In other ward, first the research data were considered as descriptive method perspective studying the subjects demographical information including age, sex, education, sport background or coaching. The descriptive statistics also were evaluated in the field of research variables. Then, the correlation coefficient was used to study the research hypotheses.

**Table 1.** The mean questions related to the role of mass media in women changing tendency towards public and championship sports in the under-study groups

group	Question 1	Tenth agent
Scientific board	4.35 ± 0.72	4.35 ± 0.72
Broad casting employers	4.55 ± 0.50	4.55 ± 0.50
The press employers	4.08 ± 0.82	4.08 ± 0.82
Physical training employers	4.78 ± 0.53	4.78 ± 0.53
Total	4.71 ± 0.63	4.71 ± 0.63

According to the obtained data, the under study subjects presented their agreement that mass media play key role in changing women tendency towards public and championship sports (Table 2). The results from Kruskal-wallis statistical test representing that no any significant difference found

between the groups of the study. In other words, the whole groups of the research state that mass media have great impact on changing women tendency towards public and championship sports ( $p=0.096$ ).

**Table 2.** The difference between the under-study group in the field of mass media role in changing women tendency towards public and championship sports (Kruskal-Wallis test)

	K - square	Df	P
Question 1	6.347	3	0.096

**Table 3.** The mean questions related to the role of mass media in absorbing economical situations of public and championship sports in the under-study groups

group	Question 7	Ninth agent
Scientific board	3.66 ± 1.07	3.66 ± 1.07
Broad casting employers	3.77 ± 0.99	3.77 ± 0.99
The press employers	3.83 ± 1.00	3.83 ± 1.00
Physical training employers	3.82 ± 1.01	3.82 ± 1.01
Total	3.77 ± 1.01	3.77 ± 1.01

According to the obtained data, the under-study subjects presented their agreement that mass media play key role in absorbing economical situations in public and championship sports (Table 3). The results from Kruskal-Wallis statistical test representing that no any significant difference found between the groups of the study. In other words, the whole groups of the research state that mass media have great impact on absorbing sports. ( $p=0.0898$ ).

**Table 4.** The difference between under study groups in mass media role to absorb economical situations in public and championship sports (kruskal-wallis test)

	K - square	Degree of freedom	P
Question 3	0.723	3	0.868

**Table 5.** The mean questions related to the role of mass media in women's tendency towards public and championship sports

group	Question 2	Question 31	Question 32	Twelfth agent
Scientific board	3.85 ± 0.81	4.16 ± 0.75	3.76 ± 0.75	3.92 ± 0.45
Broad casting employers	4.12 ± 0.91	3.80 ± 1.13	3.65 ± 1.07	3.85 ± 0.81
The press employers	3.87 ± 0.94	3.83 ± 0.96	3.83 ± 0.91	3.84 ± 0.62
Physical training employers	4.23 ± 0.77	3.95 ± 0.96	3.90 ± 1.07	4.03 ± 0.69
Total	4.06 ± 0.85	3.95 ± 0.94	3.80 ± 0.98	3.93 ± 0.66

According to the obtained data, the subjects presented their agreement that mass media play key role in women's tendency towards public and championship sports. (Table 5). The obtained results

from the test of kruskal-wallis representing that no any significant difference was found among the under-study groups. In other words, the whole research groups state that mass media have great impact on women's tendency towards public and championship sports. ( $p=0.379$ ).

**Table 6.** The difference between under-study groups in the field of mass media and its impact on women's tendency towards public and championship sports (Kruskal-Wallis test)

	K - square	Df	P
Question (2,31,32)	3.086	3	0.379

**Table 7.** The mean questions related to the homogeneity or unhomogeneity of mass media performance in terms of physical training targets in the under-study groups

group	Question 5	Sixth agent
Scientific board	2.59±0.96	2.59±0.96
Broad casting employers	2.95±1.06	2.95±1.06
The press employers	2.58±0.80	2.58±0.80
Physical training employers	2.20±1.18	2.20±1.18
Total	2.58±1.04	2.58±1.04

According to the obtained data, the under-study subjects stated their agreement that the mass media performance is homogenous with the aims of physical training but it goes to negative direction (Table 8). The obtained results from Kruskal-Wallis test representing that no any significant difference found among the under-study groups. In other words, the whole research groups stated that the performance of mass media is not homogenous with the aims of physical training affairs ( $p=0.948$ ).

**Table 8.** The difference between the under-study group in the field of mass media performance homogeneity or unhomogeneity with the aims of physical training affairs in under-study groups (Kruskal-Wallis test)

	K - square	Df	P
Question 5	0.364	3	0.948

**Table 9.** The mean questions related to the role of mass media in the progressive of investment in public and championship sports among the under-study groups

group	Question 24	Thirteen agent
Scientific board	3.73±1.03	3.73±1.03
Broad casting employers	3.50±1.21	3.50±1.21
The press employers	3.50±1.10	3.50±1.10
Physical training employers	3.64±0.96	3.64±0.96
Total	3.61±1.06	3.61±1.06

According to the obtained data, the under-study subjects stated their agreement that mass media have a great role in the public and championship sports (Table 9). The results from Kruskal-Wallis statistical test representing that no any significant difference found among the under-study groups. In other words, the whole research groups state that mass media play key role in the progression of public and championship sports investments ( $p=0.731$ ).

**Table 10.** The difference between under-study groups in the field of mass media role in the progression of public and championship investment (Kruskal-Wallis test)

	K - square	Df	P
Question 24	1.194	3	0.754

## Discussion and conclusion

Based on the research results, it is obvious that mass media have great role in changing women attitudes towards public and championship sports. The effect of mass media is not intriguing for everyone. These media appears in different forms providing new form of the life. Aschel (2008) concluded that in despite of the intangible effectiveness of mass media on public in the society, it is one of the most powerful sources of modern community. In other words, it's a great tool for handing the management and innovation in a society being a high-potential substitution for power sources. For the related feature, media are able to shift the related regulations of the society as well (17). In sport, these media can be seen efficiently so that Ghiami (2009) concluded that mass media play key role in sport marketing publishing the sport fields (10). In the present study, most country's experts believe that our country, fortunately have an increasingly growth in the field of women tendency towards public and championship sports, which media have the highest inaugurative position in this regard. Hamid Ghasemi (2007) stated that the development of sport is an essential national development issue which TV has the highest potential in this regard (8). The results of the present study is matched to Ghasemi et al (2008). Ghafouri et al (2006), Hajizade (2007), Real (2007), Brenstein (2008) and Grifithine (2006) (8, 7, 15, 12, 13). Another important factor influencing on the sport development effect is the phenomenon of professionalism distract that traditional sport. Sport is the main issue of increasing every society's health physically and mentally. This modern sport has the same difference which our traditional economy is established as based on it. As the economical production is based on removing people

requirements, the traditional targets mass media are the newest form of social phenomenon have been expanded along with the development of industry, economy and culture during half decade ago. The media sport is also considered as an economical commodity not only filling the volume and capacity of the media but also they are suitable tools for making sport and non-sport markets. Media always play key role in the relationship between sport and economy. Sport events have been prepared by different form of media getting sold efficiently. Today, the attraction of spectacular and financial support of media is significant issue because sport can bring lots of profitable markets in this regard. The big TV channels broadcast and make contraction with international Olympic committee to get the highest profits through selling these sport events and advertisements. The results of the present study showed that mass media have greatest role in absorbing different economical situations at sport. Yousefi et al (2007) concluded that the internet can play great role on the sport economy (13). Ghafouri et al also (2008) concluded that mass media generally prefer to publish the champion sports to get lots of profits in this regard (6). Also, Brenstein's research (2008) indicated that the Swedish administration invest on championship sport to increase public sport. However, some researchers pretend that in spite of public and championship sports development, these finally get separated together, one towards health, other one to tradition (16). Undoubtedly, people's environment is mostly being affected under media functions. For the highest penetration of mass media play key role in individuals decisions conducting them to a correct path. The effectiveness of media happens when public thoughts form paying attention to the system of relationship affairs. Mass media with their awaring feature trying to make people conscious about different events. They also try to conduct people towards important issues of a society.

Mainly, these media like making events exaggerative. It can be said that what transferred to the media have been edited and amended in messages framework, coming from the society. It may be important issues for people and other audiences. The navigatory role of media includes educational roles, News, heritage transformation, recreational and advertisement affairs. If media act on their own main roles they can lead to the growth of knowledge and consciousness in a society. Because they cause to the formation of connective language among people nationally and internationally. In Ghafouri and Rahmanseresht's research (2006), physical training experts comments towards the role of mass media (Radio, TV and newspapers) in people's tendency

towards public and championship sports was assessed efficiently. The results showed that mass media particularly TV, have great role in sport but it is not coincidence with a society's requirements now. Mass media pretends to championship sports due to their high profitability. In the other hand, in recent years people mostly prefer recreational activities.

The aim of the present study is to evaluate the effect of media on public championship sports and to find its relationship with sport and media. Also, the results indicated that media have significant effect on people tendency and behavioral change towards sport (7). The present study's results are matched to Eschel (2005), Charlne (2007) and Hajizade (2007) (14, 18). The results also showed that the process of mass media particularly in sport is not coincidence with the physical training and sport purposes. Usually, a series of different fields like sport is being governed to move along with the same direction showing the highest focus on sport activities and affairs. In despite of high-potential of sport papers, if an organizing purpose happened in the field of managerial issue, high efficiency will be taken place in the media coverage as well and in addition, the lack of any disorganization may not lead to increase the specified targets in this regard. Of course, this can be a kind of barrier against all cohesive management and applied potentials at sport. In the other hand, all sport graduated individuals would be useless in the field of sport media section. Emam oghlou (2006), in a study on media performance in Turkey concluded that 74% of media functions are belonged to the governmental and 57% of private media performances in 2005 have been coincidence with Turkish country. The results of Brenstein (2008) showed that more than 43% of American private mass media function is not coincidence with physical training purposes. (16). The results are coincidence with Ghasemi (2007) (9). The present study showed that the performance of media has a great role in the progression of investment in public and championship sports. The article 44 and privatization is an essential managerial approach providing better spaces for handling innovations and methods. Therefore, establishing any financial resources to non-private section (privatization framework) can be the greatest fundamental base of sport diversity. This of course brings happiness and cohesion among a country's nations together. The reunification of above-mentioned parameters can make sport media as the most powerful tool in the field of people and families happiness and leisure times. It seems that increasing the number of clubs and sport complexes particularly women sport by private sections can be explaining reason of the above hypothesis. The present results of the research are

matched to Ghasemi (2007), Mesner (2005), and Ghiamired (2009) (9, 10, 16).

### Conclusion

In this study, I reviewed the whole experts comments with this question whether media and newspapers can develop women sport. There is an increasing result that almost a relationship exists between the whole expert groups which they have been trying to reach to better position in this regard. Sport press must change the whole sport elements (championship, professional, educational, organizations, women, handicapped people and local natives) because in the studies the attention of media to women sport is extremely different in terms of championship and professionalism sports. The most emphasis is being viewed on the soccer. Even, there is no a specified definition of championship and professionalism sport fields. The sport journals have been divided into two groups of completely scientific and high level sport and the other as low level sport fields. In the scientific or quantity-based study also specified that some of magazines as complete scientific sources are not enough printed in the field of sport. The second group of sport magazines with the lowest level in written issues was belonged to the highest number of community. Some other magazines are getting in the middle level of written sport topics and they are in very limited numbers. Unfortunately, the real purpose of sport magazines has not been specified precisely. All these should be based on coherent structure following media's purpose as well. Again, unfortunately, in the field of women sport publications distributing the main aims of the media in sport, the related approaches have been conducted weakly.

While other advanced countries have special strategies to approve their own sport purposes particularly those magazines working in governmental section. In the field of national purposes some different fields such as sport is being edited conducting media to pursue along with these purposes to be focused on the sport fields. In general, in despite of suitable potential and good capacity of sport journals (more than 15 sport magazine and more pages of public newspapers devoted to sport pages), channel three and the present sport programs in other national and provincial channels in the country play key role in the field of sport affaires. If a good organizing issue in the field of management can

be conducted purposefully in the media, the full efficiency of media coverage would happen in the field of national sports particularly at championship sports.

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## Numerical solution for pricing Asian option by using Block-Pulse functions

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**Abstract:** The valuation of path dependent Asian contingent claims is a difficult matter in mathematical finance. Only in some simple cases the no-arbitrage price of a path dependent contingent claim is computed in closed form. The numerical methods for solving arising equations are limited. In this paper, we propose a new method based on Block- Pulse Functions (**BPFs**), their operational matrix and direct method. Furthermore, we obtain an estimation of the error bound for this method by projection operator and prove the method is convergent. Numerical examples demonstrate the efficiency and accuracy of this approach.

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**Keywords:** Black-Scholes equation, Block Pulse Functions, Partial differential equation, Asian option dependent problem, Exotic financial derivatives

### 1. Introduction

Asian options are a variety of so-called exotic financial derivatives, where the contract specifies a future payoff depending on the average of stock price or index over a specified period in the future. These options can be more useful than ordinary or vanilla options, particularly in circumstances when an investor is more interested in average or regular exposure to an asset over a period rather than exposure on a particular data. There are many varieties for Asian option, for example: Fixed strike Asian options whose payoff is the difference between the average price and a fixed strike price, Floating strike options whose payoff is the difference between the final stock price and the average stock price and American versions of the Asian option, which allow for early exercise (opposed to the European version which can only be exercised at expiry). There are also variations in terms of how the averaging is defined. The most important is whether the average is arithmetic or geometric [4,5,8,14]. In this paper, we discussed arithmetic average option for European version. The pricing of Arithmetic Asian option has been tackled by a variety of analytical approximations and numerical algorithms. They are at least four methods for solving this problem. Monte Carlo simulations, which calculate the price by directly simulating the stock price process, numerical solution of a partial differential equation formulation of the problem, via finite difference or finite element methods [1,9,11], analytical representations in terms of infinite series and integral formulae, for example Laplace transform, which usually require numerical algorithms in order to recover the price[9], Density approximations which replace the sum of Lognormal density by a more tractable density[8], Lattices and

Binomial trees which are related to finite difference method[13].

The **PDE** for an Asian call option with value  $V(S, I, T)$  is:

$$\frac{1}{2} \sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} + S \frac{\partial V}{\partial I} - rV = 0, \quad (1)$$

with final condition

$$V(S, I, T) = \max\left(\frac{I}{T} - K, 0\right),$$

where,

$$I(t) = \int_0^t S(x) dx, \quad (2)$$

is the average of the history of the asset price, where we know that this is independent of the current price. Also, we can treat  $S, I$  and  $T$  as independent variables.

This paper discusses the issue that arises in the valuation of these instruments in a no-arbitrage Black-Scholes (**B-S**) frame work, as well how these problems may be solved via piecewise polynomials, for example Block Pulse Functions (**BPFs**), Haar functions or Walsh functions, etc. We solve (1) by two dimensional Block-Pulse functions and apply their operational matrix. Thus, the corresponding **PDE** is converted to a nonsingular linear system. The outline of this paper is as follows: In section 2, we obtain Analytic solution for (1). Block-Pulse functions are discussed in section 3. In section 4, error estimate for Block Pulse Functions are given. In section 5, operational matrix for partial derivatives are given. We use direct method for solving (1) in section 5. In section 6, error analysis for this method, using projection operator, is given. Numerical examples are given in section 7.

**2. Analytical solution**

In order to be able to solve the problem (1) subject to (2) numerically, we perform a variable transformation [13]:

$$x = \frac{Tk - tI}{S}, V(S, I, t) = \frac{S}{T} u(t, x), \tag{3}$$

by which Rogers and Shi [10] have reduced the PDE from two variables to one. By straight forward calculation, we have

$$\frac{\partial V}{\partial t} = \frac{S}{T} \left( \frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} \left(-\frac{I}{S}\right) \right),$$

$$\frac{\partial V}{\partial I} = \frac{S}{T} \left( \frac{\partial u}{\partial x} \left(-\frac{t}{S}\right) \right),$$

$$\frac{\partial V}{\partial I} = \frac{U}{T} + \frac{S}{T} \frac{\partial u}{\partial x} \left( \frac{tI - Tk}{S^2} \right),$$

$$\frac{\partial^2 V}{\partial S^2} = \frac{2}{T} \frac{\partial u}{\partial x} \left( \frac{tI - Tk}{S^2} \right) + \frac{S}{T} \left( \frac{tI - Tk}{S^2} \right)^2 - \frac{2S}{T} \frac{\partial u}{\partial x} \left( \frac{tI - Tk}{S^2} \right), \tag{4}$$

substituting these into (1), we get

$$\frac{\partial u}{\partial t} + \frac{\sigma^2}{2} x^2 \frac{\partial^2 u}{\partial x^2} - (1 + rx) \frac{\partial u}{\partial x} = 0,$$

with final condition

$$u(x, T) = \max(-x, 0). \tag{6}$$

Thus, under the transformation (4), the arithmetic average of Asian option with fixed strike price is reduced to a Cauchy problem (4), (5) as a 1-D parabolic equation in the domain  $x \in \mathcal{R}, 0 \leq t \leq T$ . The PDE is defined on the whole real axis. Note that in [12,13], a formula was obtained for the case  $x \leq 0$  as:

$$V(S, I, t) = S \left( \frac{1 - e^{-r(T-t)}}{rT} \right) + e^{-r(T-t)} \left( \frac{1}{T} - k \right). \tag{7}$$

By making the change of variables as in (4), we get

$$u(x, t) = \frac{1}{rT} (1 - e^{-r(T-t)}) - x e^{-r(T-t)}. \tag{8}$$

We consider the solution of the PDE only for  $x \geq 0$  using [8] for the boundary condition at  $x = 0$ , the complete system of Rogers and Shi's PDE is therefore

$$\frac{\partial u}{\partial t} + \frac{\sigma^2}{2} x^2 \frac{\partial^2 u}{\partial x^2} - (1 + rx) \frac{\partial u}{\partial x} = 0, x \geq 0, t \geq 0, \tag{9}$$

$$u(x, T) = 0, \tag{10}$$

$$u(0, t) = \frac{1}{rT} (1 - e^{-r(T-t)}), \tag{11}$$

$$u(L, t) = 0. \tag{12}$$

**Two dimensional Block-Pulse functions**

Block-pulse functions have been studied and applied extensively as a basic set of functions for signal characterization in system science and control. This set of functions was first introduced to electrical engineering by Harmuth in 1969 [2,3]. A set of two dimensional Block-Pulse functions  $\Phi_{i_1, i_2}(x, t)$  ( $i_1 = 0, 1, 2, \dots, m_1 - 1, i_2 = 0, 1, 2, \dots, m_2$ ) is defined in the region  $x \in [a, b]$  and  $t \in [c, d]$  as:

$$\Phi_{i_1, i_2}(x, t) = \begin{cases} 1 & (i_1)h_1 \leq x < (i_1 + 1)h_1, (i_2)h_2 \leq t < (i_2 + 1)h_2 \\ 0 & \text{otherwise} \end{cases}, \tag{13}$$

where  $m_1, m_2$  are arbitrary positive integers, and  $h_1 = \frac{b-a}{m_1}, h_2 = \frac{d-c}{m_2}$ . There are some properties for 2DBPFs as following:

The 2DBPFs are disjoint and orthogonal with each other. It is clear that  $(5)$

$$\int_a^b \int_c^d \Phi_{i_1, i_2}(x, t) \Phi_{j_1, j_2}(x, t) dx dt = \begin{cases} h_1 h_2 & i_1 = j_1, i_2 = j_2 \\ 0 & \text{otherwise} \end{cases}. \tag{14}$$

The 2DBPFs set is complete, when  $m_1$  and  $m_2$  approach infinity [6,7]. We can also expand a two variable function  $f(x, t)$  into BPFs series:

$$f(x, t) \cong \sum_{i_1=0}^{m_1-1} \sum_{i_2=0}^{m_2-1} f_{i_1, i_2} \Phi_{i_1, i_2}(x, t), \tag{15}$$

through determining the block pulse coefficients:

$$f_{i_1, i_2} = \frac{1}{h_1 h_2} \int_{(i_1)h_1}^{(i_1+1)h_1} \int_{(i_2)h_2}^{(i_2+1)h_2} f(x, t) dx dt, \tag{16}$$

in the region  $x_1 \in [a, b]$  and  $x_2 \in [c, d]$ . Also, Parseval's identity holds:

$$\int_a^b \int_c^d (f(x, t))^2 dt dx = \sum_{i_1=0}^{m_1-1} \sum_{i_2=0}^{m_2-1} f_{i_1, i_2}^2 \|\Phi_{i_1, i_2}\|^2. \tag{17}$$

Also, for vector forms, consider the  $m^2$  elements of 2DBPFs

$$\Phi(x, t) = [\Phi_{0,0}, \Phi_{0,1}, \dots, \Phi_{0,m_2-1}, \Phi_{1,0}, \dots, \Phi_{1,m_2-1}, \dots, \Phi_{m_1-1,0}, \dots, \Phi_{m_1-1,m_2-1}]^T(x, t). \tag{18}$$

Above representation and disjointness property, follows:

$$\begin{pmatrix} \phi_{0,0} & \phi_{0,1} & \dots & 0 \\ 0 & \phi_{1,0} & \dots & \phi_{1,m-1} \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \phi_{m-1,m-1} \end{pmatrix} \quad (19)$$

$$\int_c^d \int_a^b \Phi(x,t)\Phi^T(x,t) dxdt = h_1 h_2 I. \quad (20)$$

also,

$$\Phi^T(x,t)\Phi(x,t) = 1, \quad (21)$$

$$\Phi(x,t)\Phi^T(x,t)V = \tilde{V}\Phi(x,t), \quad (22)$$

where  $V$  is an  $m^2$  vector and  $\tilde{V} = \text{diag}(V)$ . Moreover, it can be clearly concluded that for every  $m^2 \times m^2$  matrix  $B$ :

$$\Phi^T(x,t)B\Phi(x,t) = \tilde{B}^T\Phi(x,t), \quad (23)$$

where  $\tilde{B}$  is an  $m^2$  column vector with elements equal to the diagonal entries of matrix  $B$ . For simplicity, from now on, we use  $m_1 = m_2 = m$ .

**Operational matrix for partial derivatives**

The expansion of a function  $u(x,t)$  over  $[0,1] \times [0,1]$  with respect to  $\phi_{ij}(x,t), i,j = 0,1, \dots, m-1$ , can be written as

$$u(x,t) \cong \sum_{i=0}^{m-1} \sum_{j=0}^{m-1} u_{i,j} \phi_{i,j}(x,t) = U\Phi^T = \Phi U^T, \quad (24)$$

where

$$U = [u_{0,0}, u_{0,1}, \dots, u_{0,m-1}, u_{1,0}, \dots, u_{1,m-1}, \dots, u_{m-1,m-1}]$$

$\Phi =$

$$[\phi_{0,0}, \phi_{0,1}, \dots, \phi_{0,m-1}, \phi_{1,0}, \dots, \phi_{1,m-1}, \dots, \phi_{m-1,m-1}]$$

, and

$$\phi_{ij}(x,t) = \begin{cases} 1 & \frac{i}{m} \leq x < \frac{i+1}{m}, \frac{j}{m} \leq t < \frac{j+1}{m} \\ 0 & \text{otherwise.} \end{cases} \quad (25)$$

$$u_{ij} = \frac{1}{h^2} \int_{\frac{i}{m}}^{\frac{i+1}{m}} \int_{\frac{j}{m}}^{\frac{j+1}{m}} u(x,t) dxdt. \quad (26)$$

Now, expressing  $\int_0^1 \int_0^1 \phi_{i,j}(s,y) dsdy$ , in terms of the 2DBPFs as :

$$\int_0^1 \int_0^1 \phi_{i,j}(s,y) dsdy \cong [0,0, \dots, 0, \frac{h^2}{2}, h^2, \dots, h^2], \quad (27)$$

in which  $\frac{h^2}{2}$ , is  $i$ th component. Thus

$$\int_0^1 \int_0^1 \Phi(s,y) dsdy \cong P\Phi(x,t), \quad (28)$$

where  $P$  is  $m^2 \times m^2$  matrix and is called operational matrix of double integration and can be denoted by  $P = \frac{h^2}{2} P_2$ , where

$$P_2 = \begin{pmatrix} 1 & 2 & 2 & \dots & 2 \\ 0 & 1 & 2 & \dots & 2 \\ 0 & 0 & 1 & \dots & 2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & 1 \end{pmatrix} \quad (29)$$

so, the double integral of every function  $u(x,t)$  can be approximated by:

$$\int_0^1 \int_0^1 u(s,y) dsdy \cong \frac{h^2}{2} U^T P_2 \Phi(x,t), \quad (30)$$

by similar method  $\int_0^1 \Phi_{ij}(s,t) ds$ , in terms of 2DBPFs as:

$$\int_0^1 \phi_{ij}(s,t) ds \cong [0,0, \dots, h, 0,0, \dots, 0]^T \Phi(\dots), \quad (31)$$

and

$$\int_0^1 \Phi(s,t) ds \cong hI\Phi(\dots), \quad (32)$$

Now, we compute operational matrix for  $\frac{\partial u}{\partial t}$

as:

$$\int_0^1 \int_0^1 \frac{\partial u(s,y)}{\partial y} dsdy \cong \frac{h^2}{2} (U_t^d)^T P_2 \Phi(x,t), \quad (33)$$

and

$$\begin{aligned} \int_0^1 \int_0^1 \frac{\partial u(s,y)}{\partial y} dsdy &= \int_0^1 (u(s,t) - u(s,0)) ds \\ &= \int_0^1 (U^T \Phi(s,t) - U_f^T \Phi(s,0)) ds \\ &= hU^T I \Phi(x,t) - hU_f^T \Delta_1 \Phi(x,t), \end{aligned} \quad (34)$$

where  $U_f^T$  is boundary vector and  $\Delta_1$  is the following  $m^2 \times m^2$  matrix :

$$\Delta_1 = \begin{pmatrix} H_{m \times m} & & 0 \\ & H_{m \times m} & \\ 0 & & \ddots & \\ & & & H_{m \times m} \end{pmatrix}, \quad (35)$$

with

$$H_{m \times m} = \begin{pmatrix} 1 & 0 & 0 & \dots & 0 \\ 0 & 0 & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & 0 \end{pmatrix}, \quad (36)$$

from (31) and (35) we can conclude:

$$U_t^d \cong \frac{2}{h} (U^T - U_f^T \Delta_1) P_2^{-1}, \quad (37)$$

by the same method, operational matrix for  $\frac{\partial u}{\partial x}, \frac{\partial^2 u}{\partial x^2}$  are given

$$\frac{\partial u}{\partial x} \cong (U_x^d)^T \Phi(x, t), \quad (38)$$

$$\frac{\partial^2 u}{\partial x^2} \cong (U_{xx}^d)^T \Phi(x, t), \quad (39)$$

where

$$U_x^d = \frac{1}{h} (U_{\xi_2}^T \Delta_3 - U_{\xi_1}^T \Delta_2) P_2^{-1}, \quad (40)$$

$$U_{xx}^d = \frac{1}{h^2} (U_{\xi_2}^T \Delta_3 - U_{\xi_1}^T \Delta_2) P_2^{-1} (\Delta_3 - \Delta_2) P_2^{-1}, \quad (41)$$

and  $\Delta_2, \Delta_3$  are the following  $m^2 \times m^2$  matrices:

$$\Delta_2 = \begin{pmatrix} I_{m \times m} & 0 & \dots & 0 \\ 0 & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & \dots & 0 \end{pmatrix}, \quad (42)$$

$$\Delta_3 = \begin{pmatrix} 0 & 0 & \dots & 0 \\ 0 & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & \dots & I_{m \times m} \end{pmatrix}, \quad (43)$$

and  $U_{\xi_1}, U_{\xi_2}$  are boundary vectors of  $u(0, t)$  and  $u(1, t)$ , respectively.

**Direct method for solving nonlinear PDEs**

The results obtained in previous section are used to introduce a direct efficient and simple method to solve equations (10) – (13). In generality we consider equations (10) – (13) of the form:

$$\frac{\partial u}{\partial t} = \frac{1}{2} a(x, t) \frac{\partial^2 u}{\partial x^2} + b(x, t) \frac{\partial u}{\partial x}, \quad (44)$$

$$\begin{aligned} u(x, 0) &= f(x), \\ u(0, t) &= g_1(x), \\ u(1, t) &= g_2(x). \end{aligned} \quad (45)$$

Approximating functions  $a(x, t)$  and  $b(x, t)$  with respect to 2DBPFs we have:

$$\begin{aligned} a(x, t) &\cong \Phi^T(x, t) A = A^T \Phi(x, t), \\ b(x, t) &\cong \Phi^T(x, t) B = B^T \Phi(x, t), \end{aligned} \quad (46)$$

hence

$$\begin{aligned} a(x, t) \frac{\partial^2 u}{\partial x^2} &\cong \Phi^T(x, t) A (U_{xx}^d)^T \Phi(x, t) \\ &= (A (\overline{U_{xx}^d})^T) \Phi(x, t). \end{aligned} \quad (47)$$

$$\begin{aligned} b(x, t) \frac{\partial u}{\partial x} &\cong \Phi^T(x, t) B (U_x^d)^T \Phi(x, t) \\ &= (B (\overline{U_x^d})^T) \Phi(x, t). \end{aligned} \quad (48)$$

By substituting the above equations into (45) and using boundary and initial conditions, we obtain a linear system with  $u_{ij} (i, j = 0, 1, \dots, m - 1)$  as unknowns:

$$(U_t^d)^T - \frac{1}{2} (\overline{U_{xx}^d})^T + B (\overline{U_x^d})^T = 0, \quad (49)$$

**Error analysis**

Let the problem be of the form

$$\begin{aligned} \frac{\partial u(x, t)}{\partial t} &= Lu(x, t) + f(x, t), \quad x \in [0, 1], t \in [0, T] \\ u(x, 0) &= f(x), \\ u(0, t) &= g_1(t), \\ u(1, t) &= g_2(t), \end{aligned} \quad (50)$$

where  $f(x), g_1(t), g_2(t)$  belong to  $L^2[0, 1]$ , and  $L$  is linear operator of the form

$$Lu = -\frac{\sigma^2}{2} x^2 \frac{\partial^2 u(x, t)}{\partial x^2} + (1 + \tau x) \frac{\partial u}{\partial x} \quad (51)$$

It is assumed,  $u(x, t)$  is an element of a Hilbert space  $L^2[0, 1] \times [0, T]$  with inner product  $\langle \dots \rangle$  and norm  $\| \cdot \|$  are bounded as follows:

$$\langle u(x, t), v(x, t) \rangle = \int_0^T \int_0^1 u(x, t) v(x, t) dx dt, \quad (52)$$

$$\|u(x, t)\| = (\int_0^T \int_0^1 u^2(x, t) dx dt)^{\frac{1}{2}}. \quad (53)$$

Let  $P_m$  be the projection operator defined on  $L^2[0, 1] \times [0, T] \rightarrow \mathbb{B}$ , where  $\mathbb{B}$  is finite  $m^2$  – dimensional, as:

$$u_m(x, t) = P_m u(x, t) = \sum_{j=0}^{m-1} \sum_{i=0}^{m-1} u_{ij} \phi_{ij}(x, t). \quad (54)$$

The discrete approximation of (51) is :

$$\frac{\partial u_m(x, t)}{\partial t} = L_m u_m(x, t) + f_m(x, t), \quad (55)$$

where, for each  $x, t, u_m(x, t)$  belongs to an  $m^2$  – dimensional subspace  $\mathbb{B}$  and  $L_m$  is a linear operator form  $L^2[0, 1] \times [0, T]$  to  $\mathbb{B}$  of the form  $L_m = P_m L P_m$ . (56)

First, we find an estimation of  $\|u - P_m u\|$  for arbitrary  $u \in L^2[0, 1] \times [0, T]$ .

**Lemma :** Let  $u(x, t)$  be defined on  $L^2[0, 1] \times [0, T]$  and  $P_m$  be projection operator defined by (55) then  $\|u - P_m u\| \leq \frac{\sup |u|}{2\sqrt{3}m}$ , (57)

where  $\sup |u| = \max_{0 \leq i, j \leq m-1} |u_{ij}|$  for  $0 \leq i, j \leq m - 1$ .

**Proof:** The integral  $\int_0^1 \int_0^1 u_{ij} \Phi(x, y) dx dy$  is a ramp  $\frac{u_{ij}}{m} (t - \frac{1}{m})$  on the subinterval  $[\frac{1}{m}, \frac{i+1}{m}] \times [\frac{1}{m}, \frac{j+1}{m}]$  with average value  $\frac{u_{ij}}{2m^2}$ .

The error in approximating the ramp by this constant value over the subinterval  $[\frac{i}{m}, \frac{i+1}{m}] \times [\frac{j}{m}, \frac{j+1}{m}] = I_{ij}$  is

$$r_{i,j}(s, t) = \frac{u_{i,j}}{2m^2} - \frac{u_{i,j}}{m} (t - \frac{i-1}{m}), \quad (58)$$

hence, using  $E_{ij}$  as least square of the error on  $I_{ij}$ , we have

$$E_{ij}^2 = \int_{\frac{i}{m}}^{\frac{i+1}{m}} \int_{\frac{j}{m}}^{\frac{j+1}{m}} (r_{i,j}(s, t))^2 ds dt \leq \frac{|u_{i,j}|^2}{12m^2}, \quad (59)$$

$$E_{ij} \leq \frac{|u_{i,j}|}{2\sqrt{3}m^2}, \quad (60)$$

and on the interval  $[0,1] \times [0, T]$  we have

$$\|u - P_m u\| = \max E_{i,j} \leq \frac{\sup |u|}{2\sqrt{3}m}, \quad (61)$$

**Theorem:** Let  $u(x, t)$ ,  $f(x, t)$ ,  $\frac{\partial u}{\partial x}$ ,  $\frac{\partial u}{\partial t}$  and  $\frac{\partial^2 u}{\partial x^2}$  be in  $L^2[0,1] \times [0, T]$  and  $u_m(x, t)$  be approximate solution by 2DBPFs and  $L$  be a linear operator defined as (52) such that

$$\begin{aligned} \frac{\partial u(x,t)}{\partial t} &= Lu(x, t) + f(x, t), \\ \frac{\partial u_m(x,t)}{\partial t} &= L_m u_m(x, t) + f_m(x, t) + e, \end{aligned} \quad (62)$$

then

$$\|e\| \leq \frac{1}{2\sqrt{3}m} (\sup |\frac{\partial u}{\partial t}| + \sup |Lu|) + \|(L^*)^{1/2}\|^{1/2} (\sup (u^2))^{1/2} + \sup |f| \quad (63)$$

where  $L^*$  is adjoint of  $L$ .

**proof:** By using properties of projection operators,  $P_m^2 = P_m$  and  $\|P_m\| = 1$  thus

$$e = \frac{\partial u_m}{\partial t} - \frac{\partial u}{\partial t} = L_m u_m - Lu(x, t) - L_m u_m(x, t) + f(x, t) - f_m(x, t) \quad (64)$$

$$= \frac{\partial (u_m - u)}{\partial t} + Lu - P_m L P_m u + f - P_m f, \quad (65)$$

$$= \frac{\partial (P_m u - u)}{\partial t} + Lu - P_m L P_m u + f - P_m f,$$

$$= \frac{\partial (P_m - I)u}{\partial t} + Lu - P_m L P_m u + (I - P_m)f,$$

$$= \frac{\partial (P_m - I)u}{\partial t} + Lu - P_m Lu + P_m Lu - P_m L P_m u + (I - P_m)f,$$

$$= \frac{\partial (P_m - I)u}{\partial t} + (I - P_m)Lu + P_m L(I - P_m)u + (I - P_m)f,$$

$$\|e\| \leq \left\| \frac{\partial (P_m - I)u}{\partial t} \right\| + \|(I - P_m)Lu\| + \|P_m L(I - P_m)u\| + \|(I - P_m)f\|, \quad (66)$$

now, applying the above lemma we have

$$\|e\| \leq \frac{\sup |\frac{\partial u}{\partial t}|}{2\sqrt{3}m} + \frac{\sup |Lu|}{2\sqrt{3}m} + \|P_m\| \|L(I - P_m)u\| + \frac{\sup |f|}{2\sqrt{3}m}, \quad (67)$$

It is sufficient to find a bound for  $\|L(I - P_m)u\|$ ,  $\|L(I - P_m)u\| = \sum_{j=0}^{m-1} \sum_{i=0}^{m-1} u_{i,j} \phi_{i,j}(x, t)$

where  $u_{i,j} = \langle \phi_{i,j}, L(I - P_m)u \rangle = \langle L^* \phi_{i,j}, (I - P_m)u \rangle$ ,

$$\begin{aligned} \|L(I - P_m)u\| &= \sum_{j=0}^{m-1} \sum_{i=0}^{m-1} |u_{i,j}| = \\ \sum_{j=0}^{m-1} \sum_{i=0}^{m-1} | \langle L^* \phi_{i,j}, (I - P_m)u \rangle |, \end{aligned}$$

using Cauchy-Schwartz inequality

$$\|L(I - P_m)u\| \leq \|(L^*)^2\|^{1/2} \|(I - P_m)u\|^{1/2},$$

by substituting in (67)

$$\|e\| \leq \frac{1}{2\sqrt{3}m} (\sup |\frac{\partial u}{\partial t}| + \sup |Lu|) + \|(L^*)^2\|^{1/2} (\sup (u^2))^{1/2} + \sup |f|, \quad (68)$$

$$\|e\| \leq \frac{A}{2\sqrt{3}m}, \quad (69)$$

where

$$A = \frac{\sup |\frac{\partial u}{\partial t}| + \sup |Lu| + \|(L^*)^2\|^{1/2} (\sup (u^2))^{1/2} + \sup |f|}{\sup |f|}$$

for  $(x, t) \in [0,1] \times [0, T]$ , so by hypothesis of the theorem,  $A$  is a finite number and  $\|e\| = O(\frac{1}{m})$ . So, if  $m \rightarrow \infty$  then  $\|e\|$  tends to zero.

### Numerical examples

Consider the following two examples. We solve them by direct method and numerical results obtained here can be compared with exact solution  $u(x, 0)$ . The numerical results show that with increasing  $m$ , the approximate solution gets better. To show the accuracy of the method we report infinity norm of the error which is defined by  $\|e\| = \|u(x, 0) - u_m(x, 0)\|_{\infty}$ . (70)

#### Example 1

In (8) - (11) let  $T = r = \sigma = L = 1$ , numerical results for different  $m$  are shown in Table 1. Error function between exact solution and numerical solution is plotted in Figure 1 for  $m = 5$ .

**Table 1: Error between exact solution and numerical solution in  $U(x,0)$ .**

m	5	10	20	30
e	1.0945e-4	2.8247e-4	3.7763e-5	1.1421e-5

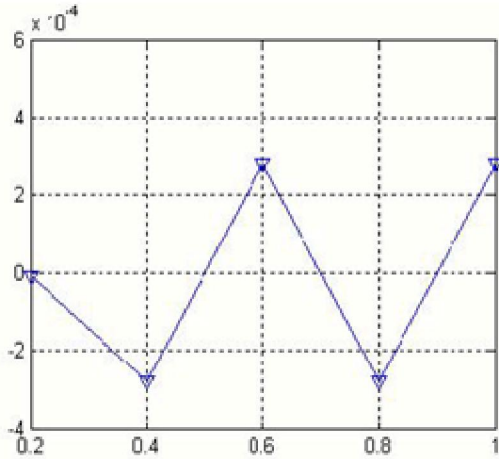
#### Example 2

In (8) – (11) let  $T = 1$ ,  $r = 0.1$ ,  $\sigma = 0.2$ ,  $L = 1$ . Numerical results for some  $m$  are given in Table 2. Error function between exact solution and numerical solution are plotted in Figure 2 for  $M = 5$ .

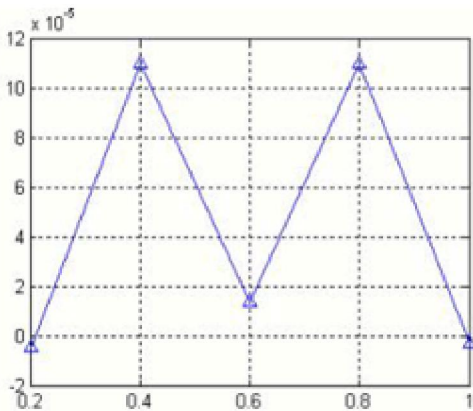
**Table 2: Error between exact solution and numerical solution in  $U(x,0)$ .**

m	5	10	20	30
e	2.7934e-4	3.8351e-4	5.2384e-5	1.5950e-5

**Figure 1: error function for  $u(x, 0)$  for example 1,  $m=5$ .**



**Figure 2: error function for  $u(x, 0)$  for example 2,  $m=5$ .**



**Conclusion**

In this paper, we introduced a new method for solving partial differential equations. We used 2DBPFs and its operational matrix to solve Asian option problem. The proposed method is simple theoretically, thus we can use it for solving linear and nonlinear partial differential equations. Also, we can apply this method to other complex options, for example, American option, Exotic option, etc.

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## Rationality and wisdom in Mowlana's Masnavi Manavi

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**Abstract:** Wisdom and rationality are one of issues considered by the philosophers, mystics and the thinkers. Among these groups, the mystics have had especial attention to this issue. Mowlana is not exception. During cultural history of Iran, because of some important historical events, there had been formed anti-rationalism and along with it the anti-philosophy movements. Majority of had had suppressed the wisdom and reasoning so that this has led to our poets and authors' world. Prominent poets such as Khaghani, Sahib Tabrizi and even Hafiz denied wisdom. There is a unique person, who appreciated the value and place of wisdom, thinking, is Mowlana Jalal Aldin. There is a considerable difference between Mowlana and his contemporaries and the other poets before him as the result of different ways in thinking. He is closer to the truth. In this paper we tried to explain this fact that Mowlana has never been against philosophy and wisdom. However, he is a unique person who appreciated and understood the place of wisdom and emphasized its dignity.

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**Keywords:** Mowlana, wisdom, general wisdom, partial wisdom, philosophy, love

### 1. Introduction

One of the most important issues considered by human beings is wisdom. Quran advises people to thinking in different affairs. For example, in 80<sup>th</sup> verses of Al Momenoon, God focuses on the place of wisdom in knowing the world: He it is who gives life and causes death, and (in) His (control) is the alternation of the night and the day; do you not then understand?

In a famous Hadith, wisdom is introduced as the first creature: God created the wisdom first", "forgiveness to people in the world and the next world based on their wisdom and rationality" (Forouzanfar, 1982:150). In a Hadith, wisdom is considered as a mean for getting close to God. In Merat al Masnavi we have wisdom as a mean for getting close to God (Homaii, 1958:552). That is, when people try to be close to God, the best way is to use wisdom.

There has been variety of definitions about wisdom concept during the history. However, the origin of rationality, especially from philosophical point of view, is Greece. Some philosophers such as Socrates, Plato and Aristotle were the primitive thinkers and philosophers who intended towards rationalism. After connecting this way of thinking and Iranian thinkers' ideas, this wisdom-centered affected them in a considerable way. Among the primitive thinkers belonging to that period of Iran and East of earth, we can name some like Kennedy, Abouali Sina, Farabi etc. they offered new way of thinking and ideology to Islam and also a new Islamic procedure and philosophy. From the beginning, Islamic philosophy had been in conflict

with religious people and Philosophers. This conflict has continued during the cultural and religious history.

In the middle of 5th Hijri century, a prominent thinker was born: Imam Mohammad Ghazzali. He started conflict with wisdom and philosophy. The reason was that Ghazzali thought that there should be incompatibility between religious guidelines and philosophical principles and doubt. Therefore, he tried to write a book called "Tahafat al Falasef". It had an irreparable and brittle effect of philosophy and rationality. Although Ibne Rosht wrote "Tahafat al Tahafat" to reject Ghazzali's ideas, the former has had much more effect and it could not reproduce the past glory (Ghazzali, 2003:8-7).

In short, this event changed believes and ideas of literary people and even the thinkers. They suppressed wisdom and rationality in each part of their works. However, in this paper we aim to study the view and thoughts of Mowlana about wisdom and his tendency towards it. The literary background of wisdom reflection in Masnavi is available in these articles:

1. Praise and criticism of wisdom in Masnavi, Reza Shajari has tried to analyze different aspects of wisdoms introduced by Maulana in Masnavi.
2. Wisdom in Masnavi: Esmail Tajbakhsh tried to study Mowlana's tendency and view towards wisdom.
3. Terms of Mowlana in Masnavi: Ali Asghari studies the terms made by Maulana in wisdom collection.

4. "Soudaye Sabba souzi" by Khalil Hadidi and Mohammad Ali Mousazadeh who tried to explain and describe Mowlana's anti-rationalism and anti-philosophy attitudes. They came to this conclusion that Mowlana was not against wisdom and rationalism.

### Discussion

Prominent mystic of 7<sup>th</sup> century, Mowlana is one of the rare intelligent and genius people in the world. There are many reasons for his fame. One of valuable reasons for being famous refers to his deep thinking and meditation. It was not only an assigned but acquired ability. That is, he tried hard to reinforce this ability. Mowlana (the first book of Masnavi, verse 1822) says:

Do scratch and cut in this way again and again, do not stop till the last moment.

In wisdom, there are obvious differences between Mowlana and the other predecessors and successors. Mowlana's works are mainly better than the other thinkers and scholars' ideas.

Wisdom concept means stopping the diarrhea and a kind of camel's foot strap. It means wisdom, knowledge and receiving the things' attributes such as good and bad, perfection and imperfection, good and evil an ability to differentiate good things from bad ones (Dehkhoda, 1946:370). In terms of levels and types, wisdom is classified to two forms: theoretical and practical. Theoretically, it starts with potential wisdom and includes actual, Mostafad and Belmalek wisdoms which is the 4<sup>th</sup> phase of theoretical wisdom. In 10<sup>th</sup> wisdom, active wisdom, the Holy Spirit finishes. Practical wisdoms consist of solution, emptying or Destruction (Ibid, 374).

A main and basic point that is considered as the differential part between Mowlana and the other thinkers is that he believed to hierarchical wisdom as we can see different levels of wisdom in creation, it starts with the first wisdom and continues to tenth one or active one. From 1960 to 1964 verses of Masnavi's fourth book we can see:

We have two kinds of wisdom: one is acquiring which is achievable through going to school

The other is Allah's forgiveness to you; it does not need any studying and trying

Mowlana knows the people's appearance as their wisdom reflection. It roots in people inside. He believes that people who have mystical mind, in spite of being engaged in physical appearance of things, wisdom save and helps them (first book of Masnavi, verses 1111-1112).

Wisdom is hidden and the appearance of the world is extended one. We are just a wave or moisture of that

What is in appearance must be used as a mean to get the deeper parts of sea.

In second book of Masnavi and 710-711 verses, Mowlana points to appearance of wisdom:

Oh you! A person loves your wisdom: person, who loves their appearance, has seen it so many times.

Your feeling is your wisdom reflection; you should know the difference between gold and copper

In the other part, he states that people's conscious perceives the phenomenon and the events. Wisdom tends to analyze the affairs and deeply think about them. People who imitate, their mind will gradually losses its ability. In second book of Masnavi and verse 2322, Mowlana says:

Worm destroys the wood; we should protect the tree in seedlings

Here the worm is appearance and wisdom is seedlings

Although your wisdom leads towards the higher levels, imitation moves towards the lower levels

### Value and place of wisdom

In verse 1109-1110 of first book, Mowlana talks about the place, endless dignity and extensity of wisdom:

- Wisdom is so extended and wide
- Our appearance in this sea seems like a bowl on the water surface.
- Mowlana, in verses 2497- 2498 of the first book in Masnavi, talks about privilege and value of wisdom and resembles wisdom to Imams:
- Imams and saints have the best wisdom.
- Look at them as the most trustable people
- In verses 2621-2622 of the first book in Masnavi, Mowlana resembles wisdom to an old guide (Murshid):
- As the result of imitation, this old man has ignored the wisdom
- In verses 2621-2622 of the first book in Masnavi, Mowlana resembles wisdom to concupiscence:
- Ego is like a woman who sometimes seeks remedy, she sometimes want to be the ruler and sometime a humble person.
- Wisdom is not aware from these thoughts as it just think about God
- Mowlana believes that wisdom which lightens the darkness and be good guide, is suitable for leadership (verse 3690 of the first book in Masnavi):
- In a deep dark night which seems illusive, accept the wisdom's leadership and guide
- In verses 2960- 2961 of the first book in Masnavi, Mowlana talks about the importance of wisdom and its value and uses Prophet Mohammad's quotations:



- Get help from God to do your works. This a way that the others cannot step forward
- His shadow has covered the earth like mountain (Gaff Mountain); his spirit is so high and perfect

#### **Dogmatic and blamed wisdom**

Mowlana believes that if we want to understand the world and even the beyond that with this descended and lower level wisdom, we will definitely lose our way. He called it a dogmatic wisdom. In verse 1295 of fourth book and verse 4138 of sixth book and verse 2528 of second book and verse 463 of fifth book in Masnavi, he says:

Part of wisdom is not wisdom extraction, it needs techniques and skills

Partial wisdom is like a vulture whose feather eats the others' corpse

Your wisdom of wisdom is your brain and wisdom, animals' stomach is always skin of the barley.

Partial wisdom defamed the wisdom and the world's temptation made a man to lose the world

In other words, he uses the partial wisdom as discursive and reasoning wisdom. That is, a philosopher who works merely with partial discursive and reasoning will fail in his attempt to get perfection. In verses 1982- 1985, Mowlana in his first book of Masnavi says:

Partial wisdom rejects the love, though it looks like leader of the head

It seems so intelligent and cute but is not

It just accompany us in speaking not practically

In these verses the focus is only on one main and basic point and that is partial wisdom not general one. From Mowlana's point of view, love and wisdom are opposite each other and they contact each other when wisdom wants to know love from its lower and inferior place. We know that this kind of understanding is incomplete and imperfect. Therefore, when this partial wisdom is connected to a source of wisdom and grace and becomes perfect and complete, it will no longer have inferior level. It will be able to apprehend the objective and abstract affairs.

Again, Mowlana in his Masnavi, verses 2051-2053, admires the wisdom and blame the partial wisdom:

That fall is worthless in God's idea; wisdom and soul are like spring and endless.

If you have a partial wisdom inside yourself, try to find perfect wisdom in the world

Your partial wisdom will be completed by its help. The perfect wisdom will dominate the soul.

In fact, in Mowlana's idea, partial wisdom is derided and rejected one.

Wisdom is the one that is created by the truth, not the one brought by Mercury

You will keep predicting this wisdom till death time, till Blowing the Trumpet in the day of resurrection

This wisdom goes beyond the death and grave and never leaves it to wonders of the world

#### **Praised and perfect wisdom**

Along with partial and blamed wisdom, Mowlana talks about praised and perfect wisdom which is empyreal one. He also verifies and accepts it (verse 4075 in sixth book and verse 2188 in fourth book of Masnavi):

Wisdom is like a feather for human being which leads the person

A rational person is one who guides and helps the caravan

In verses 1986-1991 of fourth book and verse 993 in sixth book of Masnavi, Mowlana talks about faith wisdom as one kinds of praised wisdom:

Faith wisdom is the arm of justice person. He is like the ruler and police of the city

In the body, wisdom is the head of faith whose power and effect limits the sensuality

Evil can get the faith and wisdom of this fool group by giving them material things

Perfect wisdom, in Mowlana's view, is abstract one free from any materiality. The hierarchy of this world depends on طولييه wisdoms. The other meaning of perfect wisdom is the one that dominates the environment and can perceive the realities as well as possible. This kind of wisdom, as Mowlana says, is especially for Imams, prophets and God higher level creatures (Homaii, 1958:469). In verse 978 of second book and verse 1309 of fourth book and finally in verse 465 (Kolale Khavar) he says:

This world is just a thought of perfect mind. Wisdom is like a king and the others are like Prophets

Perfect wisdom is what the crew sees, the partial wisdom looks every things

Both perfect wisdom and perfect soul are God creatures. You should not think that the throne and seat are independent from him

#### **Wisdom and philosophy**

Mowlana criticized the philosophy which is superficial, inflexible, cold and lack of inner intuition. It has blind imitation, challenging and superficial reasoning. However, if it were in metaphysical and divine area of philosophy, Mowlana himself would verify that. In verses 1960-1964 of fourth book in Masnavi, Mowlana says:

We have two kinds of wisdom: one which is achievable through going to school. Another one is God's blessing which is internal land spiritual

In “Soudaye Sabasouzi” article, it is said that Mowlana prefers psychosis to wisdom. In “disagreement with reasoning” we have: Mowlana respects wisdom and value of reasoning in his territory. Without referring to wisdom hierarchy which starts with first and perfect wisdom and leads to sustenance wisdom, which is the most inferior wisdom in this hierarchy, he calls all the wisdoms imperfect.

In the other part (verses 3437-3439 of first book in Masnavi) it is said that philosophical reasoning is based on suspicion and it is also vulnerable and fragile.

It should be mentioned that Mowlana criticizes only a group of philosophers who are materialistic and had focused on physical appearance of affairs. These philosophers never studied the divine philosophy of famous people such as Molla Sadra or Sheikh Eshragh etc. The fact is that mystic’s controversial with philosopher is in beginning of mystic journey and getting philosophy. Looking carefully makes clear that wisdom essence and philosophy logic roots in intuition and inner mysticism. During promoting the ranks and going to higher levels, human beings get a place in which there will be no difference between mystic and the wise except this case that one’s speaking is based on his observation and the other’s is based on his knowledge: Like meeting of Abu Saied Aboulkheir with Abu Ali Sina. Also, while passing the academic and spiritual levels, human being gets a position in which the evolutionary book of the world equals with prophets and Imam’s book, word by word (Homaii, 1958:422).

Philosophers rejected by Mowlana, do not accept God. In most of verses by Mowlana talks about philosophy and uses interpretive letters which describe the sentence after themselves. Therefore, Mowlana rejects a philosophy that does not accept God. The rejected philosophy is limited to just this world and cannot go beyond that (first book of Masnavi, 3278-3283).

A philosophy which rejects the God’s epithet, it is far away from prophet’s senses

This philosophy talks about inferior issues, wisdom do not come out of the closet

This philosophy is never accepted in mind and thought; it says go and hit your head to that wall

Like a mouse which has a limited view, he has limited worldview

Logic which does not root in revelation, is nonsense and lives in vacuum

Science of these philosophers belongs to this world (Masnavi, fourth book, verses 1516-1517):

Details of geometry, astronomy, medicine and philosophy which root in this world, never find their way to heaven

When philosophy helps person to go to higher levels and except material world, it focuses on metaphysical aspects of life, it is considered as a ladder and a mean which help human being to get closer to God. On the whole, philosophy and philosopher in Mowlana’s view, is not a person who studies philosophy, but he thinks beyond that. He means a person who follows the partial and perfect wisdom, either an illiterate common person or educated philosopher who participate in philosophical controversies and discussions (Homaii, 1958:947).

### Conclusion

Mowlana perceived the value and place of wisdom and thinking more than the other thinkers before and after him. He focused on them much more than the others. To describe the value and privilege of wisdom, Mowlana resembles it to Imams. He believes that we must follow up the wisdom which lightens the darkness and opens the windows to person.

Mowlana states that when a person wants to know the world and even beyond that with his descended and low level wisdom, he will definitely lose the way. He calls it “Partial Wisdom”. In other words, he believes that partial wisdom is equal with reasoning one. In the way that if a philosopher wants to get perfect reasoning through partial reasoning, he will definitely lead to failure.

From Mowlana’s view, wisdom and love are opposite each other and they will contact when wisdom tries to know the around world and love from lower and inferior level.

Perfect wisdom, which is an abstract, far from the material things and aligns with perfect self, is in abstract world and the hierarchy of existence depends on longitude wisdoms. In other words, perfect wisdom dominates everything which appropriately appreciates it. This kind of wisdom, from Mowlana’s view, is especially for prophets, Imams and some creatures Of God. We can say that he admires the perfect wisdom. Whenever he blames wisdom, he means a wisdom which is partial. About philosophy, when he blames and criticizes the philosophy, he means a philosophy which is cold, superficial and lack of intuition. This kind of philosophy is a kind of imitation and reasoning which leads to superficial negotiations and controversies. However, if it is a metaphysical and divine one, Mowlana definitely accepts and verifies it.

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## A Review on Causes and Factors Affecting on the Power Structure of Rural Culture in Iranian Society of Post-Islamic Revolution

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**Abstract:** Although, historically, the political power structure of Iranian society has partly been under the influence of the structures of rural, tribal, and also traditional urban culture, this trend has been accelerated after the revolution in 1979 due to extreme migrations of villagers to cities and the intermingling of the rural-urban culture and also taking power of resented social groups with rural origins. Coming to the power of these social groups has made a kind of duality in Iran's political power structure. This duality led to some turmoil and disorder among government and the people on national interests and solving the problems of the society. The present article tries to examine causes and factors affecting this dispute and considers the cognitive aspects of this issue, particularly the sociological aspects. The results of this study show that the political structure in Iran and its structural characteristics are under the influence of rural culture and socio-economic aspects. In other words, the political power structure is the result of social and rural connections.

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### 1. Introduction

The two ways of living, i.e. rural and nomadic have always been common in Iran since the old times. Therefore, many social issues cannot be explained without paying attention to such a historical fact. Urban life has always been there as a climatic form of living, but rural and nomadic life was dominant and encompassed the majority of Iranian society. Although living in towns and cities has a history of thousands of years in Iran and some of the Iranian cities are among the oldest cities of the world, the citizens were just a minority group of elites and higher-class people, the lower class people who lived in cities just served that minority group of the society. On the other hand, urban life in Iran depended on rural and nomadic ways of living for most of its history. Thus it should be emphasized that the urban form of living in Iran had always been one limited form side by side the other forms of rural and nomadic life that included the majority of people (Fakouhi, 1383:337).

As the capitalist (industrial) relations and arrangements entered the country, urbanization began to develop and soon became the predominant form of living. This began three decades ago and now the urban population of the country has reached to 65% of the total population. We cannot deny, however, the fact that the fast reduction of the rural population in no way means that the rural society lacks the power to influence the urban life; on the contrary, it means that the migration of the rural and nomadic

population to the cities has changed the characteristics of urbanization in Iran. Therefore, there are rural or nomadic towns that in spite of having the physical form of a city, in fact, are big villages and have transferred the rural characteristics to the special form of the cities. These phenomena, which are completely new, can be called the ruralization or nomadication of cities. Most of the mechanisms which are seen in rural and nomadic systems are reproduced and become commonplace in other forms in cities (Fakouhi, 1383:337).

The power structure, in particular the political power structure, has never been an exception. The administrative, bureaucratic and political institutions and organizations of the country have historically incorporated both types of urban and rural social life. Furthermore, the relations and arrangements of capitalism brought some forms of western political structure to the society, and accordingly some institutions and organizations were founded. However, the power structure under the influence of the traditional methods remained elderly-headed, tribe-based and metaphysical. As a result, today Iran faces an unorganized set of old and new forms of exercising power, and a kind of normlessness is ruling the power structure; which is because, the management of the society has encountered difficulties in managing economic-social issues.

### 2. Statement of the problem

Since the old times, the political power structure and its application in Iran has been under

the influence of the leaders of ethnic group, rather than economic or class divisions of the country. This is due to the special combination of the Iranian population and other factors and elements, which has made up the Iranian society. Using this particular structure, the political-ethnic management has altered the social differences and conflicts into tribal, racial and cultural campaigns (Seifollahi, 1995:163).

According to some researchers, the political history of Iran in fact is the history of ups and downs of tribes and nomads. Due to their cultural and social potentialities, the Iranian nomads not only have acquired the local power but also have possessed power over the whole country. The nature of power exercising until the early Pahlavi reign was nomadic, so the cultural structure was based on the family relationship, security, being alien to the outsiders, wealth searching, and the unstable system of thought of the nomads (Sariolghalam, 1997: 4, 8).

Historical studies show that the way in which the political power is exercised in Iran has always caused some disturbances in the political and social arena and some social instability and periodical crises in the country, which most of the time has made it difficult to achieve the social and national agreement. This old power structure cannot cope with the nature of modern periods and is unable to conform to the new situations and conditions. Productive and active presence in the new world needs a backup of new thought and ethnics, and requires serious reflection on the modernity. The proper understanding of the historical experience of Iran can lead us to new horizons (Tabatabaei, 1975:6; Tabatabaei, 1976:290).

Therefore, the influential factors on social developments should be clearly understood and a basis be made on the historical experiences for establishing a modern system. To know the underlying factors which affect this structure would help us analyze the power structure academically and scientifically, localize the perspectives, and facilitate the decision making about more appropriate methods of dealing with political power structure.

The cultural-social issues in Iran, despite their importance, are neglected; while it seems that the root of many social flaws of every period in Iran may originate from the culture of the country. This has been the most outstanding during the last two centuries. The traditional balance has shaken due to the influence of western civilization and culture, but no new balance has taken its place yet. The conflict between traditional culture and the new one (tradition and modernity) is just one of the cultural reflection of the problems that Iran encounters. Thus the basic questions are:

1. What are the fundamental social factors that influence the power structure, particularly

the political power structure of Iranian society?

2. How does the mechanism of the effects of rural culture on power structure in Iranian society work?
3. Have the elements of rural culture after the 1979 revolution in Iran in comparison to the other eras had more influence on the political power structure?
4. Has the origin of the leaders of the movement (Islamic Revolution) had an effect upon the way power is exerted in Iranian society?
5. Do the psychological values based on rural culture have any influence on the power structure of Iran after the Islamic Revolution?
6. Have the cultural and social values originating from rural culture influenced the power structure of Iran after the Islamic Revolution?
7. Is it true that the power structure of Iran after the Islamic Revolution has been subject to the social and economic values based on the rural culture?

### 3. The study objectives

According to the above discussion, the overall aim of the study is to attain a theoretical paradigm for investigating the political power structure in the Iranian society. This aim is subdivided into the following objectives:

#### A) Primary objectives

1. To examine the underlying factors of rural culture and their relationship with the power structure of Iran.
2. To recognize the basic cultural-social factors that influences the power structure, especially the political power of Iranian society.
3. To identify the dimensions and levels of the effects of the rural culture on the power structure as a social phenomenon in the Iranian society.
4. To recognize the subjective and objective reflections of the effects of the rural culture on the power structure in post-revolutionary Iran.
5. To develop sociological researches and to apply them in order to solve political issues of Iran.

#### B) Secondary objectives

1. To study the power structure transformation in the Iranian society (with the aim of historical formation of the subject).

2. To determine the gap between the power structure of Iranian society and the intellectual, logical and ideal structure (ideal type) of using power.
3. To analyze and to describe the current views about the subject.

#### 4. Theoretical framework

According to the characteristics of using power in the Iranian society as well as the political structure and culture of the country, the central and despotic power has always influenced the macro, mid and micro level of power. The political behavior of the political and administrative elites has also been shaped by these characteristics. The use of a combinational perspective for formulating the theoretical framework originated from these conditions. The complex structure of using power in Iran and the way it is influenced by the cultural features (in particular the structure of rural culture) requires a theoretical and conceptual framework, which is combined and multi-dimensional. The theoretical framework makes use of the fundamental thoughts and notions of Ibn-e-Khaldon with respect to the emergence, growth, climax, deterioration and fall of the governments and the influencing factors involved. In addition, the opinions of Ibn-e-Khaldon about the nomadic and urban societies can be a basis for making comparisons between these two entities, and designing rural culture indicators (Ibn-e-Khaldon, 1995; Tabatabaei, 1995; Lagost, 1984).

In this study, Simmel's viewpoints in relation with the concepts of sovereignty and the dominance and the relation between the leaders and the followers and the contrastive relations or the exchange of leverage have been considered. His viewpoints on metropolitans and the characteristics of people living in these cities may give rise to formulating the range of the characteristics of urban culture and rural culture and the distinction among these two and finally designing its 'ideal type'. (Simmel, 1993). On the other hand, the thoughts of Marx Weber in the field of power and authority particularly his classification on the variety of authority (legal, traditional, and charismatic) has been reflected in this study because traditional authority and charismatic authority are two ways of ruling in Iranian society during the history. Therefore, this viewpoint may determine the conditions of exerting power in the level of macro, mid and micro. Furthermore, in designing 'ideal type' about the way of exercising power on the Iranian society, the logical authority of Weber may be a basis for the comparison in order to determine the distance of the structure of exercising power in the desirable condition (Farvand, 1983, Weber, 1994).

Considering the viewpoint of Weber with respect to pre-capitalist freemasons, Asian production system and structure of eastern authoritarian has been used in order to analyze the Iranian society realistically and precisely and also the concept of the existing ideology in the country used by the current government to make the system ethical has been studied (Weber, 1984, 2000).

In relation with the other Marxist theories, some theories has been used including: Dahrendorf theory in relation with mechanisms of power exercising in new societies and its contrasts, structural point of Althusser with respect to ideological aspect of power and the way of using ideological instruments by the governments in order to legitimate the ruling system (Althusser, 1971), Gramsci's viewpoint with respect to philosophy, culture and ideology in the revolution and the role of thought, ethical and ideological transformations in developing social transformations and also the subject of hegemony (Gramsci, 1971), the Habermas's concept of legitimacy and also the crisis of constitution in the structure of political system (Habermas, 1975, 1984). Besides, the viewpoints of New Marxism will be employed in relation with designing and formulating 'type ideal' for political structure of Iranian society (McInnes, 1972).

Michel Foucault's viewpoint with respect to the genealogy of power and the role of elites and knowledge about modifying or stabilizing the structure of power in the society and also his emphasis on this fact that action is subordinate to thought and that in every era, people's actions arise from the common thought at that age has been considered and so does his theory about power and the overlooked technique on life and also the overlooked monitoring on the scene (Darifus&Rabino, 1980; Foucault, 1972, 1979-86).

The viewpoints and notions of Anthony Giddens about structural differences of modern society and pre-modern society (traditional society) may help build indicators in differentiation of these two societies. Also, the subject of control dialectic, the concept of eradicating especially in the field of traditional authority, the concept of politics-living and finally the concept of globalization and its relation with the structure of the power and the local governments has been utilized in the theoretical framework (Giddens, 1984, 2003).

#### 5. Methodological Framework

In this study, the following methods are used:

##### Documentary Method:

The aim is to use all documents, lectures, memoirs, hand scripts, and required information. In this study, the historical analysis method has also been used, with the aim of using valid documents in order to

formulate the common characteristics of the historical phenomena and events and their causes. The transformation of the political power structure in the Iranian society and the basic reasons for such a trend has been analyzed on the basis of this method.

#### **Content Analysis Method**

The aim is to analyze the implications of the ideas, to reveal the hidden ideas and perspectives behind the scene, and to interpret the implicit aspects of the thoughts. In this study, we make use of the qualitative content analysis method, which is not necessarily statistical, so that the general subjects and contents could be interpreted and concluded.

#### **Delphi Method**

The aim is to determine the formal validity of the indicators and to achieve an agreement between a group of experts on the subjects that involve a combination of scientific evidence and social values (Sarookhani, 2004: 90-91).

In the present study, we attempted to examine comparatively some indicators related to the rural and urban culture by interviewing the experts, professors and researchers of the rural sociology discipline. Then, the indicators and the documents were searched for in the historical resources and the writings of the authors. Finally a questionnaire was developed which consisted of a set of indicators for evaluating the value system and the rural and urban culture comparatively; it was given to 31 experts of rural issues in three consecutive periods. After gathering the information, the indicators were finalized and evaluated in the light of hand scripts, memoirs and lectures of the post-revolutionary political figures.

### **6. Description and Analysis of the Results**

#### **Historical and Documentary Study Results**

This study includes four periods: Before the social-economic system of capitalism; from the constitutional Revolution to Land Reform; from Land Reform to the Islamic Revolution; and after the Islamic Revolution.

#### **1) First Period: Before the social-economic system of capitalism**

This period, the time between the formation of the first human communities in Iran and the Constitutional Revolution, includes some fast, slow and sometimes regressive economic, social and political processes. It can be divided into subcategories below:

1. Period of food gathering that existed before the arrival of Aryans to the Plateau of Iran, and was dominant way of economic-social living.
2. Period of pastoralism that reached its highest point by the invasion of Aryans to the plateau of Iran.

3. Period of subsistence agriculture that began with the inhabitation of Aryans and continued until the start of the Constitutional Revolution. In this period, which is the longest in the formation of social-economic structure in Iran, different and sometimes heterogeneous ways of economic, social and agricultural life existed (Seifollahi, 1995: 163-164).

#### **2) Second Period: from the constitutional Revolution to Land Reform**

The Constitutional Revolution called the centralized and unharnessed government for a great challenge. The people, under the influence of different factors, wanted fundamental and structural change and transformation in the ruling system and the management of the Iranian society. The focus of the people was on the establishment of a system that paid more attention to the people's participation. So the reasons behind the Constitutional Revolution can be summarized as below:

- 1) The influence of western culture and civilization and the theoretical challenge with the west caused the Iranian society to compare itself to the western world and feel its sever backwardness, which in turn stimulated the people's dissatisfactions.
- 2) The growth of the traditional urban middle-class in the Iranian society increased the dissatisfaction among people and paved the way for uprising of revolutionary power in the urban society.
- 3) The advent of intellectual class and the establishment of secret associations and parties deepened the social awareness, extended the social demands, and thus prepared the ground for revolutionary conditions.
- 4) Lack of justice and the prevalence of oppression (extensive social dissatisfaction)
- 5) Sever poverty and inequality between the social classes.
- 6) Weakness of the central government, and the endeavor for harnessing the uncontrolled power (Frasatkhan, 1993; Abrahamian, 1999; Forah, 1999; Kasravi, 1990, Haeri, 1988; Zibakalam, 1998).

#### **3) Third Period: Land reform to the Islamic Revolution**

The downfall of the national government of Dr. Mosaddegh in July 1953 by an English-American coup changed the post-war Iran radically in different aspects. First of all, America took the traditional role of Britain and Russia in Iran and became the only foreign power that controlled the country. The very big share of Americans in the new oil consortium (40 percent) and their great share of providing supplies and weapon consultancy confirm the above fact.

Secondly, the American backing of the Shah dictatorship weakened the Iranians' hope of enjoying the support of America for establishing a more democratic government. Thirdly, Shah showed a great deal of interest in modernizing the Iranian society and economy, and strengthening the military basis of the country to become a western country. These ambitions and the tendency to implement big formal projects made Iran increasingly dependent on the western countries and America in particular. Fourthly, Shah chose the way of oppressing and intimidating the opposition, and paid less attention to the people's participation; he limited the right of free speech severely and made the country's atmosphere very oppressive. The establishment of 'the Intelligence and Security Organization of the Country' (SAVAK) and putting the opposition and critics of the government under pressure made people more hateful and angry (Kady, 1990: 217-222).

#### **4) Fourth Period: After the Islamic Revolution**

In 1978, the increased class conflicts and people's dissatisfaction of the economic, social and political conditions of the country led to the triumph of the Islamic Revolution. The Revolution disintegrated the foundation of the economic, social and political and cultural system of Shah's reign and opened a new chapter in the history of economic development of Iran. In these years, a lot of political and social tensions occurred, which reached its pick in the fights and conflicts of 1981 (Seifollahi, 1995: 92; Kady, 1990: chapter 9). The revolutionary conditions endangered the security of investments, and aggravated the migration of the investors and efficient human resources. On the other hand, the revolutionary government nationalized the big-scale industries and agricultural entities. The tensions between Iran and America put an end to their economic political relations. The oil incomes of Iran decrease gradually, reaching its lowest point during the eight-year war. The war started with the Iraqi aggression, which harmed the industries and economic structure of the country seriously (Foran, 1999: chapter 9; Abrahamian, 1999: chapter 11).

##### **4-1) Period of the establishment and stabilization of the Islamic Republic**

'The main political events after the victory of the Islamic Revolution were mostly under the influence of Imam Khomeini and his religious followers' (clergymen) way of thinking. Therefore, the status of other groups, including the conservatives and liberals of 'Jephe-ye-melli' (National Frontier), the leftist Islamic or nonreligious groups, and the racial minorities (Kurds, Torkmans, Balouches, and etc.) or even the top cleric critics, gradually faded away' (Kary, 1369: 379).

The victory of this way of thinking in the referendums of April 1979 and the Constitutional Approval strengthened the basis of the Islamic Republic system and paved the way for the establishment of a system based on 'Velayat-e-Faghih', in which the whole power goes to just one Faghih.

In July 1979, the banning of the publications, organizations and political groups started and suddenly 22 newspapers and magazines were closed down. Other publications that mainly belonged to the political groups gradually stopped releasing till the end of the year 1979 and mid 1981, due to the post-revolutionary changes, the war and the political conflicts between political groups and organizations on one side and the officials on the other (Bijani, 1384:99-100).

Although the revolution was mainly urban, the leadership had access to the rural population. According to the Ayotollah Khomeini's recommendations, the clerics (Rohanion) went to the villages to mobilize the rural people. The economic-social changes of the past, in particular the White Revolution, had facilitated their task. The changes had freed the rural and nomadic people from their masters and tribal chiefs so that they could have direct contact with the government and closer business relations with the cities. The rural Mollas had taken the role of small business workers' helpers instead of being the local masters' speakers. After the Islamic Revolution, the clerics had great opportunities to do their tasks, because the economic-social development of the time had broken the traditional links between masters and farmers, village heads and villagers, and tribal chiefs and peasants; thus the modernization played a wonderful role in strengthening the traditional clerics (Abrahamian, 1999: 495-6).

The outset of the war and its lengthened continuation could bring about the victory of the revolutionary forces over the west-inclined liberals and para-religious groups who opposed the new system, and also gradually mobilized the people specially the youth so that they could encounter the enemy and go to the front. So with the influential messages of the leader and the national emotions that were arisen by the enemies' attacks, the great force of Basij (Paramilitaries) and Sepah-e Pasdaran-e Enghelab-e Eslami (Army of the Guardians of the Islamic Revolution) were shaped. At the same time, there were a lot of changes in the army structure as a result of encountering the enemy. The Iraqi attack which according to the public opinion was cruel and insulting to the national pride stimulated the national emotions in such a way that opposing it and defending the country became a social value for the



people (Rafiepoor, 1376: 135-137). The power structure, which was realized during those years, consisted of different elements that showed the very characteristics of the Islamic Republic system. Firstly, from ideological point of view, there were explicit elements of a whole-power government, but at the same time the government lacked the institutional elements and the special hierarchy needs for such a system. Secondly, as far as the power structure is concerned, there were characteristics of a so-called formal or superficial democratic political system. Thirdly, especially during the 1370s the system had the characteristics and elements of a para-democratic political system.

#### **4.2) Period of Reconstruction (1989-97)**

In this period, the technocrats (Kargozaran) of the Islamic Republic system decided to change the direction of the revolution. There were several positive elements: to change the closed society into the open one; to be flexible about the religious-traditional patterns; to employ the experts; to use new methods in place of the old ones which seemed unsuccessful; and to reduce the government control over the economy. One of the most important steps to achieving the goals was to change the Constitution so as to give more power to the president in the hierarchy of power, at that time the prime minister had the executive power and the president didn't have enough power to take the necessary measures. Furthermore, the most important consequence of changing the Constitution was the change in the hierarchy of power, not only in relation to the presidency, but also in the whole structure of the Islamic Republic (Rafiepoor, 1997: 150-151).

#### **4.3) Period of Democratic movement (an endeavor to attain the civil society)**

The legitimacy and participation crisis of the previous period as well as the economic, social, cultural and political problems led to the phenomenon of 2 June 1997. The radical and leftist groups of the first period revised their views and value principles to form a type of coalition with the modern rightists who had announced their existence as technocrats in the last period. The nonconformists intellectual and academic groups who were hurt and disillusioned by the previous atmosphere of the country joined the coalition and could encourage the ordinary people to join them.

'A new active political class was created in these periods that had clear democratic aspirations and rather clear ideology, though it has been in some degrees successful in organization just during the recent years. Although the new middle class is the social basis for this active social class, its principle trait is not pure economic needs but the cultural, social, ideological and political demands whose

realization requires the establishment of democratic institutions. In general, the core of the new political-social groups was the intellectual who made up this active class according to their intellectual ideals (Bashirie, 2003:130).

#### **7. Conclusion**

The historical and field studies (content analysis) show that the political power structure has always been under the influence of the rural culture with its own indicators and elements. Of course, the scale of this influence has been varied in different historical periods. The rural culture in a way has determined the power structure of the Iranian society.

Furthermore, the studies indicate that the political power structure in Iran, especially after the Islamic Revolution, has been affected by the rural culture and its principle elements more than ever. Field studies (qualitative content analysis) on the influence of the movement's leaders and political figures prove the above-mentioned fact. These affects after the revolution had been greater than other periods; there are two main reasons for that: first, the origin of the movement's leaders and the political figures was often the rural society which influenced their attitudes, views and social-political actions greatly. Second, with the Islamic Revolution, the social, cultural and political structure returned to the traditional values of the society and challenged the western codes and values. This traditional culture had its origin in the elements and components of the rural culture. Thus, with the Islamic Revolution there was a new challenge for the modern and western values, which strengthened the traditional and rural culture more than before. Besides, the political structure power in Iran after the Islamic Revolution in Weber's words was fluctuated among three kinds of authority structure (traditional, charismatic and logical) and in different periods, one kind of authority were dominated. Finally, the Iranian society still tolerates the mixture of these three authorities and is trying to achieve into democratic goals despite many challenges. The political power structure is inclined to move towards one of these authorities on the basis of the conditions and circumstances, therefore faces a kind of confusion and disorder.

The study shows that due to inappropriate principles such as traditionalism, allegiance culture, closed worldview, ethical and religious prejudice, imitations, curiosity in people's privacy and so forth, the existing rural culture brought about a kind of structure and political relations in the country that people suffer from and ask for fundamental changes. These principles and teachings in Simmel's words have established dominance and sovereignty and the relation between leader and the follower as a fundamental basis in the political and social structure.

Likewise, the nature of power and government in the Iranian society in Marx's word has become ideological and according to the notions of Dahrendorf, Althusser and Gramsci the political system and the power structure in the country made use of ideology so as to legitimize the ruling system. This system is based on religious teachings and principles and also making the whole society in the realm of politics. In spite of making use of the whole existing tools for legitimating, such political structure faces with a kind of crisis in legitimacy that originates from the lack of community involvement in the political administration. Such structure in Giddens' words is basically different from new structure power in the western society and will be in challenge with global structure and finally it is difficult for them to attend in the international scene so that the globalization process will be unreachable for Iranian society.

The implications of such power in the political, social and culture structure includes: widespread use of coercive force, development of malfunction of ruling institutions against other institutions, formulating the gap and historical mistrust of people to government, feeling of social and individual insecurity, crisis of legitimacy in Iran, government's inability in control of the behaviors, weak influence of government on people, periodical crisis and cultural and political difficulties in the society.

### 8. Suggestions

The nature and structure of the present study do not allow us to give executive suggestions based on the findings. The historical and field studies of the political power structure of Iranian society, however, give the opportunity to the researchers to suggest some general theoretical solutions. Accordingly, the following observations seem appropriate to consider:

- 1) Apparently, the first step to reduce the unpleasant consequences of using political power in the Iranian society is to criticize the tradition and modernity. In other words, by refining the culture and the cultural resources, which originate from the traditions and the national customs, we should clear the cultural structure of the society of the backwardness and wrong teachings formed during the last centuries, and make the way for appearing the effective and useful elements of our own culture. On the other hand, we should criticize the modernism and use the positive results of the western civilization; we should make a deep and organic link between the refined traditions of the past and the modern conditions to clear up the social and political structures.
- 2) Disintegrating the present dual imitative dual situation, and challenging the reality and thoughts of the west will bring about the rebirth of Iran. This requires a strong ideological backing of intellectual thought and modern political philosophy, whose formation has been impossible as a result of dual imitation. Neither just returning to the past and renewing it can put an end to the present deterioration, nor will just imitating the west lead us to the streamline of insight. Criticizing the tradition, raising the basic questions of the modern time, and formulating its topics and concepts will take the first steps to the establishment of the political-social philosophy of the rebirth of Iran. In this respect, to properly understand the historical experience of the country on the one hand, and the essential experience of the rebirth in the west on the other, are necessary but not sufficient conditions.
- 3) The historical studies show that the revolutions and social norms may improve the social-political surface structure, but the social-political and cultural infrastructure doesn't necessarily change. The political power structure is the result of the social, cultural and economic factors and conditions of the society, so the improvement of the political structure cannot happen without cultural structural reforms. Thus the intellectuals, elites and the statesmen should prepare the cultural conditions for establishing the democratic structures and institutions in the society. In other words, the social and cultural changes could bring about the political changes in the society.
- 4) To acknowledge the nature and power of the informal culture in the society by the government and to try to truly understand the elements of the culture in order to adapt the political structure accordingly. In other words, the statesmen should accept the fact that the people are real origin of culture and power in the society and to try to escalate their participation in the political, cultural and social arenas, instead of having exclusive control over them. This will assure the legitimacy and authority for the government. The political power should consider the idea of civil society and the development of the people participation in different scenes of the society as something, which would diminish the people participation in different scenes of the society as something, which would diminish the people-government conflicts, and then support it.
- 5) The political structure should always attempt to facilitate the nation-building process and get away from the ethnic and religious fanaticism. The Iranian society historically consists of

different ethnic groups, and there are varied religious minorities and micro-cultures in our country. The nation-building process should focus on the participation of all social micro-groups and allocate fair proportions of the power resources and wealth of the society to them, otherwise there are serious challenges facing it. The process makes the ethnic groups and social or religious minorities think of the national interest before considering their own ethnic or group interest, and try to promote the national culture.

- 6) The endeavor to make the relations between the government and the people more rational, and to determine the limits of using power in the society could minimize the tensions and conflicts caused by lack of mutual understanding between the people and the statesmen in different social, economic, cultural and political areas, and pave the way for a constructive interactions to form a developed and powerful country.
- 7) The government, by being aware of the exact status of our own culture as well as other cultures in the world, can pursue proper and less tense interaction in the international scenes. Relying on the origins of the native culture, the government can also give predominance to rationality, innovation, futurity, social realism, social security, lawfulness, employing the worthy, competitiveness, etc. in the social and cultural relationships. This makes the world structure interact respectfully and constructively with the statesmen.
- 8) Religious clear-sightedness and religious renaissance in the Iranian society makes it possible to change the thoughts and attitudes of the people and to pave the way for basic cultural transformations. The religious-thinking reform will remove the anti-development social and cultural ideas and put progressive values and beliefs in their place. The religious elites and intellectuals can stimulate the cultural dynamism in the society by reproduction and reinterpretation of the religion.

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## A Comparative Study for Evaluation of Different Brands of Metformin Hydrochloride 500 Mg Tablets Marketed in Saudi Arabia

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**Abstract:** The aim of the present study was the evaluation and comparison between six different Metformin hydrochloride brands which are commercially available in the Saudi Arabia market. The physicochemical equivalence of six brands of Metformin hydrochloride tablets were determined through the evaluation of both official and non-official standards according to the USP pharmacopoeia including uniformity of weight, friability, hardness, disintegration, dissolution rate and drug content. A variation of the concept of dissolution efficiency (DE), known as predicted availability equivalent (PAE), was used to predict the likely in vivo bioavailability. All the tested six brands were bioequivalent and complying with the official tests for weight variation, friability, disintegration and dissolution tests. The friability test was within the specified limit. All formulations were disintegrated within 15-30 min. The tested brands were identical according to their dissolution evaluation. Only Glucare<sup>®</sup> was nonequivalent to the innovator Glucophage<sup>®</sup>. The percentage content of active ingredient of six brands of Metformin tablets showed values within the monograph specifications (95-105%). All the six brands evaluated in this study could be considered biopharmaceutically and chemically equivalent and therefore they can be substituted with the innovator product in clinical practice except Glucare<sup>®</sup>. Therefore, patients can safely switch from one brand to another.

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**Keywords:** Dissolution test, Metformin hydrochloride, Quality control of tablets

### 1. Introduction

Metformin HCl is an oral anti-diabetic drug from the biguanide class used mainly to treat type 2 diabetes mellitus. Metformin hydrochloride works by improving the body's sensitivity to insulin, allowing it to use glucose in the normal way. It is the first-line drug of choice for the treatment of type 2 diabetes, particularly in overweight and obese people and those with normal kidney function. Metformin hydrochloride is also being used increasingly in polycystic ovary syndrome (PCOS) which is a syndrome of ovarian dysfunction and hyperandrogenism [1]. Evidences suggest that insulin resistance and resulting hyperinsulinaemia play a central role in the pathogenesis of the syndrome. Metformin, an insulin sensitizer, not only improves hyperandrogenism but also improves ovulation as well as pregnancy rates in patients with PCOS, non-alcoholic fatty liver disease (NAFLD) and premature puberty [2]. Metformin was first described in the scientific literature in 1922, by Emil Werner and James Bell, as a product in the synthesis of *N,N*-dimethyl-guanidine free base [3]. French physician Jean Sterne published the first clinical trial of Metformin as a treatment for diabetes. It was introduced to the United Kingdom in 1958, Canada in 1972, and the United States in 1995. Metformin hydrochloride is now believed to be the most widely

prescribed anti-diabetic drug in the world; in the United States alone, more than 48 million prescriptions were filled in 2010 for its generic formulations [4, 5].

Drug products that are biopharmaceutically and chemically equivalent must be identical in their quality, strength, purity and active ingredient release profile. They must be in the same dosage form and intended for the same route of administration [6]. Dissolution testing of drug product is an important criterion in assessing the quality control to monitor batch to batch consistency of drug release [7]. The variations in the drug release among some generics indicate deficiency in the entire drug formulation and the delivery system. Dissolution rate determination used also for prediction of in-vivo bioavailability in most oral preparations [8, 9].

Manufacturing methods and the excipients used in the production processes could contribute to the quality and release skillfulness of medicament. Therefore, to ensure the requisite quality, drug manufacturers are required to examine their products during and after manufacturing and at various intervals during the shelf life of the product [10]. Accordingly, to ensure that the generic and branded drugs products are pharmaceutically equivalent cannot be overemphasized. So, the selection of one product from several generic drug products of the

same active ingredients is concerned important for healthcare workers [6].

Metformin hydrochloride is the most popular anti-diabetic drug in the Saudi kingdom as well as all over the world. As reported by the annual statistical studies (MOH annual statistical book 2010) more than 25% of population is diabetic in Saudi Arabia. Accordingly, the use of Metformin hydrochloride tablets needs to monitor and ensure the quality of the various brands commercially available in the Saudi market in order to assess their quality control. Additionally, if these brands are interchangeable and patients can safely switch from one brand to another or not and which is the best economically. Numerous Metformin tablets brands in Saudi Arabia drug market today make a problem of alternative generic brands for physician and the pharmacist.

The present study aimed to evaluate and compare between different six Metformin tablets brands applying both official and unofficial compendia method following the USP pharmacopeia.

## 2. Experimental

### 2.1. Materials

Metformin hydrochloride brands having label strength of 500 mg (Table 1) were purchased from a retail pharmacy in Riyadh city, Saudi Arabia. All tests were performed within product expiration dates. Metformin HCL powder was a gift of (CID co. pharmaceuticals, Giza, Egypt). The reagents used were potassium dihydrogen orthophosphate (WINLAB chemicals, UK) and sodium hydroxide pellets (Poole BH15, UK). All reagents used were of analytical grade. Distilled water was used throughout the work.

**Table 1:** List of the tested commercial Metformin hydrochloride tablets available in Saudi market

Tablet	Brands	Manufacturer
A	Glucophage <sup>®</sup>	Merck santé s.a.s, France
B	Formit <sup>®</sup>	SPIMACO, Saudi Arabia
C	Glucare <sup>®</sup>	Jazeera Ph. Industries, Saudi Arabia
D	Dialon <sup>®</sup>	Julphar, U.A.E
E	Metaphage <sup>®</sup>	Kuwait Saudi ph.industries co., Kuwait
F	Metfor <sup>®</sup>	Tabuk ph. Manufacturing co., Saudi Arabia

### 2.2. Prepared reagents

Stimulated intestinal fluid pH 6.8 was prepared by dissolving 34 grams of potassium dihydrogen orthophosphate in distilled water in 2-L volumetric flask. The pH was adjusted by 1M sodium hydroxide which prepared by dissolving accurately weighted 40 grams of sodium hydroxide pellets in 1000 ml distilled water in a volumetric flask. Then the mixture was diluted to volume in a 5-L volumetric flask [11, 12].

### 2.3. Visual Inspection

The shape, size, and color of the different brands of tablets were examined visually.

The diameter and thickness of 5 tablets from each brand were measured and the average was taken and standard deviation was calculated.

### 2.4. Friability Test

Twenty tablets of each brand were weighed and subjected to abrasion using a Roche friabilator at 100 revolutions for 4 min. The tablets were dedusted and weighed again then percent of weight loss was

recorded. The friability of the tablets were then calculated using the following expression

$$\% \text{ Friability} = \frac{[(\text{Initial weight} - \text{Final weight}) / \text{Initial weight}] \times 100}{1}$$

### 2.5. Hardness Test

The crushing strength of the tablets was determined using ERWEKA (Heusenstamm, Germany) hardness tester. Sample tablets (10) of each brand were taken, a tablet was placed between the spindle of the ERWEKA hardness tester machine until the tablet breaks and the pressure required to break the tablet was then read off the machine and recorded.

### 2.6. Uniformity of Weight

Tablets (20) of each brand were weighed individually using a digital analytical balance. The average weight was determined and the percentage (%) deviation of the individual tablets from the mean was determined.

### 2.7. Disintegration Test

Tablet disintegration was determined at 37 °C using ERWAKA (Heusenstamm, Germany) disintegration apparatus. The disintegration time of randomly selected six tablets of each brand was determined in distilled water. The disintegration time was taken to be the time no granule of any tablet was left on the mesh.

### 2.8. Dissolution Rate Determination

Dissolution rates in the stimulated intestinal fluid pH 6.8 were determined using ERWEKA DT600 dissolution apparatus (Heusenstamm, Germany). One tablet was put in each of the compartments of the apparatus using 1000 mL of medium at 37 ± 0.5 °C. The basket was rotated at 100 rpm. Ten milliliters of sample was drawn at intervals of 10, 20, 30, 45 and 60 minute with 10 mL bulb pipette. A fresh 10 ml dissolution medium was replaced after each sampling to maintain the sink conditions.

Each of the withdrawn sample was filtered with syringe filter 0.45µm, the filtrate diluted. The absorbance was measured at λ max 233nm using UV-visible spectrophotometer. The concentration was determined against standard solution having a known concentration of Metformin hydrochloride RS in the same medium. The percentage of drug released is calculated using the given formula.

$$\text{Percentage of drug release (\%)} = \frac{\text{Amount of drug released (mg/ml)} \times 100}{500 \text{ (drug content in a tablet)}}$$

The difference factor (f1) and similarity factor (f2) was calculated for each local brand respect to the reference brand (Glucophage®) equation (1) and (2), respectively.

The percentage of drug released from Glucophage® as an innovative was compared with the percentage of drug released from each brand individually using the next formulas:

$$f_1 = \left( \frac{|\sum_{t=1}^n [R_t - T_t]|}{\sum_{t=1}^n R_t} \right) \times 100 \dots \dots \dots (1)$$

$$f_2 = 50 \times \log \left( \left[ 1 + \left( \frac{1}{n} \sum_{t=1}^n (R_t - T_t)^2 \right)^{-0.5} \times 100 \right] \right) \dots \dots \dots (2)$$

Where, n is the number of dissolution sample times, Rt and Tt are the mean percent dissolved at each time point, t, for the reference and test dissolution profiles, respectively.

The similarity factor should be between 0 and 100. It is 100 when two comparative groups of reference and test are identical and approaches 0 as the dissimilarity increases, factor of 50-100 ensures sameness of two products. Difference factor of 0-15 ensures minor difference between two products.

If the f2 value is greater than or equal to 50 it shows sameness or equivalence of the two dissolution profiles. If f2 is less than 50, that means the dissolution profile is different from the innovator product hence not interchangeable [13].

### 2.9. Assay of Metformin hydrochloride tablets

The test for assay is done to find out the actual amount of active ingredient present in the tablet and whether it is the same as the labeled amount.

20 tablets from each brand weighed and finely powdered then an accurately weighed portion of powder equivalent to 100mg Metformin hydrochloride were transferred to a 100ml volumetric flask, 70ml of distilled water then added and shaken mechanically for 15minutes then diluted to the volume and filtered. 10ml of the filtrate was transferred to 100ml volumetric flask and further diluted to 100ml with distilled water. Then 10ml was transferred to another 100ml volumetric flask and the volume was completed with distilled water.

An accurately weighed 100mg from RS powder added to 1000ml volumetric flask then transfer 10ml by bulb pipette to 100ml volumetric flask and complete the volume with distilled water to get 10µg/ml concentration.

The absorbances of the standard preparation and assay preparation were concomitantly determined at λmax 232nm with UV-3300PC Spectrophotometer using water as a blank. The quantity in mg of Metformin hydrochloride in the portion of tablet taken calculated by the formula:

$$10C(Au/As)$$

In which C is the concentration of Metformin HCl RS in µg/ml and Au and As are the absorbances obtained from assay preparation and standard preparation, respectively.

## 3. Results

### 3.1. Physicochemical properties of Metformin hydrochloride tablets

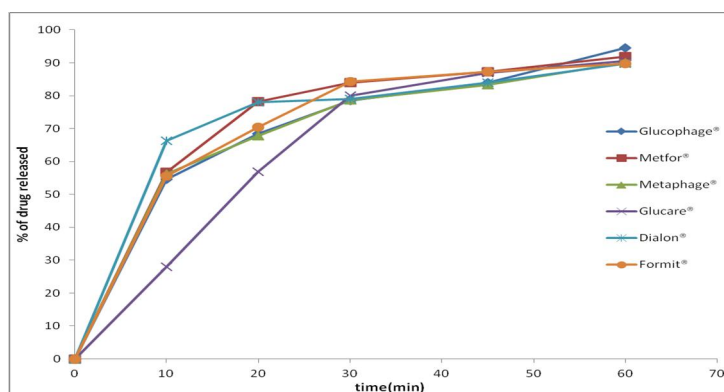
Weight variation, hardness and friability and disintegration time as well as thickness and diameter are shown in Table 2. The drug content was assessed and also shown in Table 2.

**Table 2:** Disintegration time, hardness, uniformity of weight, friability, and chemical content of six brands of Metformin hydrochloride tablets

Brands	Uniformity of weight (g) ± SD	Hardness (kg/cm <sup>2</sup> ) ± SD	Disintegration time (min.)	Assay (%)	Diameter (mm)	Thickness (mm)	Friability %
A	0.525±0.008	16±1.6	9	102	11.6±0.3	3	0.04
B	0.522±0.004	10.2±0.5	8	101.6	11±1.8	3	0.02
C	0.521±0.012	25±0.7	6	98.9	10±1.2	4.4	0.05
D	0.636±0.009	12.5±1.6	10	100.9	12.4±0.005	4.63	0.09
E	0.552±0.005	7.2±0.9	9	100.1	10±0.75	4.5	0.07
F	0.543±0.004	12±1.6	16	99	11.5±0.04	3.1	0.04

Figure 1 illustrates the dissolution profile of the six tested Metformin hydrochloride different brands.

The dissolution curve for each brand was the average of 6 tablets.

**Figure 1:** Dissolution profiles of the different brands of Metformin hydrochloride tablets. Each data point is the average of 6 determinations.

Dissolution efficiency (DE) was calculated according to the following equation and the result for each brand is cited in Table 3.

$$DE = \frac{\int_0^t y \cdot dt}{y_{100} \cdot t} \times 100\%$$

Dissolution efficiency is defined as the area under the dissolution curve up to the time,  $t$ , expressed as a percentage of the area of the rectangle described by 100% dissolution in the same time. Where  $y$  is the percent drug release as the function of time,  $t$ .  $y_{100}$  is 100% drug release and  $t$  is the total time of drug release.

**Table 3:** Dissolution efficiency % for six brands of Metformin hydrochloride

Brand A	Brand B	Brand C	Brand D	Brand E	Brand F
100	102	87	105	99.4	105.3

The similarity factor  $f_2$  and the difference factor  $f_1$  method can be used to compare two dissolution profiles. The reference drug was used. The

results of  $f_2$  and  $f_1$  are shown in Table 4 comparing the dissolution curves of five brands with the innovator brand.



**Table 4:** Values of f2 and f1 for all six brands of Metformin hydrochloride

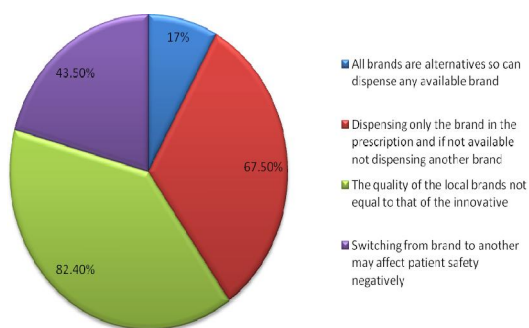
Brand	A	B	C	D	E	F
f2	100	72	45	57	93	61
f1	0	4	11	7	1	6

Table 5 shows the percentages of the patients suffered from the common side effects of Metformin hydrochloride after the first three months treatment or as a result of switching between brands.

**Table 5:** The percentages of the patients suffering from the common side effects of Metformin hydrochloride after treatment

Side effect	Number of patients	% of patients
Nausea	139	38.7%
Emesis	89	24.8%
Chest pain	72	20%
Weight loss	97	27%
Diarrhea	69	19.22%
GIT disturbance	52	14.5%
Dehydration	36	10%
Drowsiness	57	15.88%

Figure 2 demonstrates the percentage of number of pharmacists and their opinion about if different Metformin hydrochloride brands can be interchangeable in Saudi market.

**Figure 2:** The point of view of some pharmacists about brands interchangeability in Riyadh

#### 4. Discussion

Six different brands of Metformin hydrochloride tablets which are commercially available in Riyadh were subjected to a number of quality control tests in order to assess their biopharmaceutical equivalence. The assessments involved the evaluation of uniformity of weight, friability, hardness, disintegration and dissolution tests as well as

chemical content determination. All the brands used were within their shelf life as at the time of study.

The weight uniformity for the six brands of Metformin hydrochloride tablets gave values that comply with the USP specification with a deviation less than 5% from the mean value (i.e., maximum deviation value 0.012) Table 2.

Using ERWEKA hardness tester, the strength of the tablets was tested. All the tablets failed this non-official test according to USP specifications (4-6 kg). Brand E had the minimum hardness and brand C had the maximum hardness. Hardness values of brand A, B, D and F were 16, 10.2, 12.5 and 12, respectively Table 2.

Previous study on different Metformin hydrochloride brands in Nigeria [15] showed that from eight brands three brands pass the hardness test (5-7 kg) and five brands failed to have good crushing strength (10-48 kg) [15]. Another research group [16] showed that all the tablets in four tested brands showed good strength (13-15 kg).

The friability test is mostly important criteria for uncoated tablets (during and after manufacture) to examine that the tablets have a good withstand strength for transportation, packaging, shipping and coating. All the tested brands in this study are film coated tablets. The friability was also tested for these coated tablets for all brands. The friability was less than 0.2% for all the brands. The values of <1% are considered to be highly satisfactory evaluation characteristics Table 2.

The results obtained from the assessment of the percentage content of active ingredient of six brands of Metformin hydrochloride tablets showed values within the monograph specification 95% to 105% of stated amount of Metformin HCL as demonstrated in Table 2.

The observed disintegration times for all the brands of Metformin hydrochloride investigated was less than the 30-min limit prescribed by the official compendium (Table 2). All tablets of the different generic brands passed the disintegration test. The fastest disintegrated tablets were of brand E while the slowest one was brand B. The various brands could have employed different disintegrants to improve the penetration of aqueous liquids.

Dissolution of drug from oral solid dosage forms is an important aspect for drug bioavailability (i.e., the drug must be solubilized in the aqueous

environment of the gastrointestinal tract to be absorbed). Accordingly, dissolution testing of solid oral drug products has emerged as one of the most important control tests for assuring product uniformity and batch-to-batch equivalence [13, 14].

In the present investigation, the release of Metformin hydrochloride from all tablets was immediate release and the percent of drug released at 45mins was more than 70% as shown in Figure 1. The results obtained from this study revealed that all the brands passed the USP 32 general specifications standard for dissolution rate test for conventional release tablets.

Dissolution efficiencies variation known as predicted availability equivalent (PAE) is used to predict the likely in vivo bioavailability. The implication of the PAE is to express the relative ease of release and predictive release pattern of the drugs in vivo [21].

It is obvious from Figure 1 and Table 3 that various products exhibit different dissolution profiles. In order to judge whether these differences in dissolution profiles were significant, all dissolution profiles were compared to that of the originator (Glucophage<sup>®</sup>) brand A using the similarity factor ( $f_2$ ) value recommended by FDA[17]. The obtained values of  $f_2$  were: 72, 45, 57, 93, 61 for Formit<sup>®</sup>(B), Glucare<sup>®</sup>(C), Dialon<sup>®</sup>(D), Metaphage<sup>®</sup>(E) and Metfor<sup>®</sup>(F), respectively (Table 4).

Similarity factor analysis between five of the marketed tablets and the innovator brand A (Glucophage<sup>®</sup>) for the release of Metformin hydrochloride showed an  $f_2$  factor greater than 50 for all brands except brand C (Glucare<sup>®</sup>). The higher the  $f_2$  values, the more similar the dissolution profiles, so  $f_2 < 50$  represented non-similar profiles, while  $f_2 > 50$  denoted a similarity between profiles of four marketed brands B, D, E, F and the innovative brand A. So, Brand C was found nonequivalent in their dissolution profile to the originator (Glucophage<sup>®</sup>). The values cited in Table 4 shows that Metaphage<sup>®</sup> (brand E) is the most similar local product to the innovative product (Glucophage<sup>®</sup>) brand A. The similarity factor  $f_2$  was 93 and difference factor  $f_1$  was only 1.

It was mentioned recently that there is a correlation between the difference in dissolution profiles of the tested brands and their bioavailability [18]. For this reason, Glucare<sup>®</sup> (brand C) might be recommended to be unused as alternative to Glucophage<sup>®</sup> (brand A). These findings support the need for activation of the regulatory rules with emphasis on postmarketing evaluation of pharmaceutical products. This difference could be also due to the various binders and disintegrate used by different companies.

Another previous study discussed and evaluated differences between five brands of Metformin hydrochloride marketed in Jordanian Market. The results revealed that the release of Metformin hydrochloride from three brands namely, Metforal<sup>®</sup>, Diaphage<sup>®</sup> and Formit<sup>®</sup> were nonequivalent to the innovative brand (Glucophage<sup>®</sup>). The values of their similarity factor ( $f_2$ ) were 24.5, 39.4 and 28.2 for Metforal<sup>®</sup>, Diaphage<sup>®</sup> and Formit<sup>®</sup>, respectively. Only Glymet<sup>®</sup> has similarity factor more than 50. So Glymet<sup>®</sup> is equivalent according to its dissolution profile to originator [19].

In vitro dissolution methods are developed to assess the potential in vivo performance of a solid oral dosage form. The appropriate performance of drugs products is determined through the quality control tests. Recently, understanding of the physiological environment and processes of absorption, critical deconstruction of the mechanisms of release from formulations, and improved computational tools has led to a more sophisticated discussion of the role of dissolution testing in drug product design and control [20]. This previous study declared that meaningful results and interpretation of dissolution data can be achieved only when the biopharmaceutical and physical properties of the drug products are well understood, and that test methods are properly established through studies during formulation and manufacturing process design and clinical development.

The common side effects of Metformin hydrochloride were monitored through survey on a small sample of 359 patients treated with different brands, 211 of which are diabetic and 48 are not. The results obtained in Table 5 showed that the high percentage of patients can suffer from nausea and emesis especially at the first three months of the treatment or after change to another brand.

On the other side, a simple questionnaire forwarded to more than 80 pharmacists about their opinion if different brands of Metformin hydrochloride tablets are alternative to each other in Saudi market or not. Figure 2 illustrated that high percent 82% of the pharmacists believed that the quality of local brands is unequal to the innovative brand.

67% of the pharmacists don't dispense alternative brand if the prescribed brand is not available in the pharmacy.

## 5. Conclusion

Five generic brands of Metformin hydrochloride tablets, namely Formit<sup>®</sup>, Glucare<sup>®</sup>, Dialon<sup>®</sup>, Metaphage<sup>®</sup> and Metfor<sup>®</sup> together with the innovative (Glucophage<sup>®</sup>) have been subjected to analysis according to the monograph of USP 32 Pharmacopoeia. The results have shown that all the

tested brands satisfied the USP requirements in terms of identification, assay and dissolution. Dissolution profiles revealed differences between the different generics. Four generic products could be said to be equivalent to the originator (Glucophage®) while the Glucare® was nonequivalent. According to the present study patients can safely switch from one brand to another but with consulting them of the possibility of some minor GIT complications that may occur after the treatment with new alternative brand. Pharmacists have to be informed which Metformin hydrochloride brands in the Saudi market are alternative to each other.

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## Effect of Selected Physical Activities on Social Skills among 3-6 years old Children

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**Abstract:** The preschool years are critical in the development of basic cognitive and social skills. Physical activities give a child a chance to practice social skills such as sharing, turn-taking, cooperating and negotiating, and encourage the development of values such as fairness and respect for others. The aim of this study was the effect of selected physical activities on social skills and behavior problems among 3-6 years old children. Sixty children enrolled in this study. They were randomly divided into control and experimental groups. Social skills and behavior problem was assessed by PKBS-2 (Preschool and Kindergarten Behavior Scales). Gymnastic skills as selective physical activity were performed by experimental group for twelve weeks; two sessions per week. At the end of the period, both groups participated in the post test with PKBS-2. The data were analyzed with T- test. Results showed that at pre-test no significant difference was seen for the means of social skills and behavior problems between experimental and control group. But after twelve weeks gymnastic skills significant difference was observed between pre and post- test in experimental group at all social skills according to reports of parents. In addition significant difference was not observed in control group. This study showed that selected physical activities (gymnastic) are led to improvement social skills among 3-6 years old children.

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**Key words:** Social skills, PKBS-2 Questionnaire, physical activity

### 1. Introduction

The preschool years are critical in the development of basic cognitive, social behavioral. Children enter the world with many needs in order to grow properly, many child educational leaders agree that the goal of elementary education is to stimulate and guide the development of children behavior so that they will function in life activities. Caregivers, parents, and other adults, who deal with young children in some way must explore the developmental processes as they relate to the education of children (Humphrey, 2003). Young children are active and experienced learners with a natural curiosity. They are unique individuals, eager to make sense of their world, to develop relationships and to extend their social skills. Children enter their preschool years with a significant background of learning experiences, these experiences are formed within their family and with friends. Children learn through interaction taking place between the motor, cognitive, social and emotional domains. Therefore, in physical education contributes, through movement experiences that focus on basic movement skills, to the total growth and development of all young children in social skills (Zachopoulou et al., 2010). Preschoolers needs to master and utilize the ability to

manage their emotion amongst others particularly peer groups and to meet social expectations of society at large. Preschoolers often require additional structure and support in order to regulate their emotions .During the preschool years, social competence involves learning how to separate from parents and engage with peers in shared play activities. It is very important that children feel included, if children received the best participating actively in the earliest years of life, which has an important and positive part to play in ensuring that children feel secure and accepted by others, and have a sense of belonging. Children learn social skills by interacting with other children, they learn to give and take, to share in cooperative with adults, and objects or natural materials found in the environment. Play experiences with enjoyable opportunities provide multiple ways for children to learn a variety of different social skills and concepts. Play for young children provide an important and unique context that allows children to interact when social skills may be acquired (Goldman, 1998). Play is important for peer interaction; pretend play offers children opportunities to replay explore and ultimately master situations that involve intense emotional arousal, in order to regulate emotions and reduce anxiety. Free-play

activities are unable to improve fundamental social skills in children between three and five years old. Therefore the physical activities program for preschoolers should instruct and aim to develop child psycho-social needs (Miller, 1978). Children must be provided with numerous movement opportunities and experiences, because they learn through social skills with the environment. Preschoolers are beginning to form friendships and enjoy short group activities. Children in mixed-age classrooms have many advantages, have many opportunities to learn to be helpful and consider the needs of others (Essa, 2007). There is evidence that physical activities can have a positive and profound effect of social skills. In some respects, such an effect is unique in areas of child development such as cognitive development and social development (Gallahue, & Ozmun, 1998). Preschoolers are highly imaginative, they love pretending to be animals, and acting out creative fantasies about these characters. Music and motor skills all add to the fun. Gymnastics should be an integral part of the physical education curriculum, offered in kindergarten through to high school and college. The values derived from gymnastics participation are numerous, including increased self-discipline, coordination, courage, self-confidence, social awareness, and perseverance (Cooper et al., 1989). Play helps children work out the rules for social interaction and allows children to be at their best and it is important for building social competences and confidence in dealing with peers (Singer et al., 2006). Social skills are adoptive or positive behaviors that are likely to lead to a positive personal and social outcome, and have three sub-dimensions:

1. Social cooperation: "acting to gather, in coordinated relationships, in the pursuit of shared goals, the enjoyment of the joint activity, or simply furthering relationship" (Dovidio et al., 2006).

2. Social interaction: involves situations whereby the behavior of one actor is consciously reorganized by, and influences the behavior of another actor, and vice versa (Turner, 1988).
3. Social independence: A child who is independent still displays appropriate instrumental and emotional dependence, but combines this type of behavior with self-reliance, assertiveness, and a need for achievement (Turner, 1988).

According to researchers, social skill is a kind of behavior that is displayed in social situations. Social skills include skills of the individual related with his/her fellows, his/her academic skills, his/her skills to control him/herself, his/her adaptation skills and his/her entrepreneurial skills. It can be said that the most important talent group related to social skills is the one which includes the skills that support

interpersonal skills between children. It is necessary for a school child to have simple communication skills such as language, smiling, eye contact and listening and to have access and cooperation skills for an opportunity to work with a group such as being a member of a group, cooperation and helping one another. For children not to gain such skills, on the other hand, causes big social risks in their preschool education period. Lobo and Winsler (2006) examined the effect of an eight-week dance program on the social competence of 40 low-income preschool children. Their results revealed significantly greater positive gains in time in the children's social competence and with regard to both internalizing and externalizing behavior problems of the experimental group compared with the control group (Lobo & Winsler, 2006). Little evidence has been collected on the effects of gymnastics program on social behavior of children under 6 years old of age. Therefore the aim of present study was the effect of selected physical activities on social skills among 3-6 years old children.

## **2. Methods**

### **2.1. Participant**

The participants of the study were 60 preschool children ranging in ages from three to six years old, from Hamedan city in Iran. These 60 children were selected from three kindergartens. They were randomly divided into control (15 girls, 15 boys) and experimental groups (15 girls, 15 boys). All subjects not participating in any kind of sport activity before.

### **2.2. Research design**

The pretest data was collected with parents by PKBS-2 for both groups, then gymnastics program were performed by experimental group for three months; two sessions per week for one hour and in this period control group did common activities. At the end of the period (3 months), one week after the program both groups participated in the post test with PKBS-2 were filled out separately for each child by parents again. The gymnastics program is designed specifically for children ages three, four, five and six. The gymnastics educational experiences are divided into several themes; learning basic gymnastics skills such as handstands, shoulder stands, rolls and cartwheels, forward roll, backward roll, log roll, straddle roll, bridges, extensions, scales, headstand and variations, forward and back ward walking on a low -beam bar, firstly for warm up, running, jumping, catching, throwing, kicking balloons, and did back to initial mode for 10 minutes.

### **2.3. Research Instruments**

The Preschool and Kindergarten Behavior Scale (PKBS), which was developed by Merrell (Merrell, 2002) was used in order to evaluate social skills and problem behaviors of children who

participated in the study. This scale, which was originally prepared as a 34-items scale, which directed towards determination of social skills of nursery school and kindergarten children. While social skills consisted of 3 sub-dimensions, i.e. social cooperation, social interaction and social independence consisted of the sub dimensions of being self-centered/explosiveness, 34 of the statements present in the scale were intended to define social skills. The items in PKBS-2 encompass separate normative information. These items are rated on a 4- point scale in which the anchor points are as follows:

0 = Never/ 1 =Rarely/ 2 =Sometimes/ 3= Often.

High scores obtained from social skills dimension indicate that the children are developed with respect to social skills. Analysis was applied in order to provide the construct validity of the scale and Cronbach's Alpha Reliability Coefficient was 0.87.

## 2.4. Data processing

Differences between the groups were calculated with independent and dependent T-test. The SPSS package was used for the statistical analyses. A P-value less than 0.05 was considered significant.

## 3. Results

There were no differences significant between the two groups in social skills reported by parents in pretest. Results indicated that both groups are relatively homogenous before the start of the program. After three months gymnastic skills results showed significant difference in experimental group at all sub-dimension in social skills and behavior problems. But significant difference was not observed in control group according report of parents (Table 1). The results obtained in this research are presented in Tables as follows.

**Table.** Statistical analysis of experiment group and control group on the social skills and behavior problems

PKBS-2	group	Mean ± Sd	p
pretest		26.53±2.59	
Control	posttest	24.86±3.21	0.08
Social cooperation		pretest	26.06±4.14
Experi	posttest	27.83±3.41	0,000
pretest		25.66±3.85	
Control	posttest	24.76±2.79	0.168
Social interaction		pretest	25.33±4.41
Experi	posttest	26.16±4.29	0.002
pretest		25.16±3.12	
Control	posttest	25.80±3.22	0.423
Social independence		pretest	25.20±3.80
Experi	posttest	27.26±3.41	0.000
pretest		77.86±7.80	
Control	posttest	75.33±8.23	0.069
Social skills total		pretest	76.60±12.31
Experi	posttest	80.66±10.31	0.000

According to the T-test coefficients analysis between pre and post-test of the experimental group the results indicate that social skills total rated by parents increased significantly. Children who took part in the gymnastics program showed considerably greater improvement from pre-test to post-test in social skills in comparison to the control group.

## 4. Discussion and Conclusion

The current study has examined the effect of selected physical activities on social skills and behavior problems among 3-6 years old children. The study has shown that children who participated in the gymnastics program made significant gains social skills (social cooperation, social interaction, social independence) by reports from parents. Children have

more opportunities to detect the emotional states of others. Environment, practice and information guided the child's behavior. Preschoolers who are involved in a planned gymnastics and motor development program might have many opportunities to share, lead, interact, and respond to others' needs as well as their own. They learned not only to appreciate themselves, but are given a vehicle for education in the affective domain. This not only creates a positive self-image and greater social awareness for preschooler, but also develops their self-confidence and poise. To conclude, physical activity is necessary for a child's growth, it enhances physical development, cognitive development, personality development, emotional development, and the

mastering of emotional and social development: children's overall development. Physical activity is the first social experience outside the family for many children; preschool allows for intensive and frequent social interaction with peers. Children are just learning to coordinate their social behavior, peer interactions. Gimpel and Holland (2003) indicated that boys of all ages are more likely to be rated by their parents and teachers as having slightly poorer social-behavioral adjustment than girls and were significantly higher on externalizing behaviors measure while girls were higher on prosocial-behavior ratings, so physical activity is suitable for this matter (Gimpel & Holland, 2003). Social skills and behaviors required for healthy social development vary with the age of the child and both individual behavior and social outcomes are important considerations in defining socially skills behavior (Mulu, 2004). Children need to learn social skills; physical activity provides learning experience, and children learn to communicate their emotions and to form meaningful relationships with adults and other children becoming sensitive to others' needs and values. They also use play as a way to work through their own emotions, manage their emotions, learn self-control and share power, space, and ideas with others (Singer et al., 2006). These findings in this study are also supported by Lobo and Winsler (2006), they examined the effect of an eight-week dance program on the social competence of 40 low-income preschool children. Their results revealed significantly greater positive gains in time in the children's social competence and with regard to both internalizing and externalizing behavior problems of the experimental group compared with the control group (Lobo & Winsler, 2006). In addition to this, many researchers have revealed that physical activity can contribute and have a positive effect on self-esteem, mood and feelings and can decrease aggressiveness and lower anxiety and depression (Armstrong, 1984; Donaldson, & Ronan, 2006; Ekeland et al., 2004; Littleton & Engebretson, 2002). Bar-Haim and Bart (2006) examine the relationship between motor abilities and social competences. Their results indicated significant associations between motor development and social scores (Bar-Haim & Bart, 2006). Piek et al. (2008) investigated the relationship between motor coordination, emotional recognition and internalizing behaviors on 41 young preschool boys and girls. They applied the McCarron Assessment of Neuromuscular Development, the Emotional Recognition Scales, the Wechsler Preschool and Primary Scale of Intelligence, and the Child Behavior Checklist. Their results indicated that motor ability was positively related to a child's emotion comprehension and the

correlation between motor ability and anxiety/depression was significant (Piek et al., 1980). Children need to move to play to burn their extra calories if they do not take part in play; they seek other ways of burning calories. This seeking may include bothering behaviors, they either bother themselves or others. Psychosocialists have been recognized that children will develop a scene of guilt and failure if they are not allowed to learn and explore their capabilities. The gymnastic programs had a positive effect on the children's developments. They enjoyed the activities, they learned, and improved their social skills. It may help the teachers of young children to deal with their children especially in terms of physical education classes. A few studies have directed attention to sport socialization before six years of age. Buss et al (1980) also examined preschool activity related to personality across ages using the California Child Q Set (CCQ). In 129 preschool children (65 boys and 64 girls) at ages 3, 4, and 7, they found activity level related substantially to a set of interpersonal attributes as well as to an expected set of motoric attributes. They also found active children to be less shy, more assertive and aggressive, and less compliant than their less active peers, active children to be relatively uninhibited, restless and generally under-controlled and self-esteem and social skills improved (Buss et al., 1980). With regard to the effectiveness of physical activity in increasing social skills and decrease behavior problems in children, suggest that more facilities and adopt the appropriate methods, the possibility of doing sport programs for kindergarten be provided. Furthermore, one solution is to improve professional preparation and in service training for practicing teachers by providing information about strategies for planning sport. And also suggest that different kinds of sport exercises such as dancing, swimming, and football, could be involved in such programs instead of gymnastics skills.

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**MTHFR 677 C→T Polymorphism and the Risk of Cardiac Septal Defects: A Pilot Study**Omneya I Youssef<sup>1</sup> and Ghada M El Sayed<sup>2</sup><sup>1</sup>Department of Pediatrics, Faculty of Medicine, Ain Shams University, Egypt<sup>2</sup>Department of Clinical Pathology, National Cancer Institute, Cairo University, Egypt<sup>1</sup> [batata88888@yahoo.com](mailto:batata88888@yahoo.com),<sup>2</sup> [elsayed276@yahoo.com](mailto:elsayed276@yahoo.com)

**Abstract:** Congenital heart defects (CHDs) are among the most common birth defects. The majority of CHDs are polygenic diseases affected by both genetic and environmental factors. Identification of the candidate genes in folate metabolism has suggested that the 677C→T polymorphism in the Methylenetetrahydrofolate reductase (MTHFR) gene may be particularly associated with the risk of CHDs. The objective of this study was to investigate the effect of MTHFR 677C→T locus polymorphism as a risk factor for cardiac septal defects (CSDs). Forty-two patients and 90 age and sex matched infants as control group were investigated. Eleven (26.2%) patients presented with isolated atrial septal defect, (ASD), 18 (42.9%) with isolated ventricular septal defect (VSD), 8(19%) with combined ASD+VSD, and 5 (11.9%) with atrioventricular canal (AV) canal. The investigation of MTHFR 677 C→T polymorphism was determined using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). The resulting odds ratio (OR) for patients carrying MTHFR C677T mutation was 1.8 (95% CI 0.86-3.84,  $\chi^2=1.48$ ,  $p=0.11$ ) compared to the control and the OR for MTHFR 677CT genotype for patients was 2.13 (95% CI 0.97-4.69,  $\chi^2=3.63$ ,  $p=0.06$ ) attaining only marginal significance compared with TT and CC genotype in control. Patients with AV Canal showed significantly ( $p=0.007$ ) higher percentage of CT genotype (OR 1.19 95% CI 1.0-1.4) when compared with control. Patients with combined ASD and VSD showed significantly ( $p=0.05$ ) higher percentage of CT genotypes (OR 4.68 95%CI 1.03 -21.31) when compared to the control. In conclusion we suggest MTHFR 677CT genotype as a risk factor for AV canal and combined ASD + VSD, and because of the strong relation of this enzyme with folic acid we recommend preconceptional folic acid supplementation and food fortification which might decrease CSDs in Egypt.

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**Key words:** Congenital heart disease; folic acid; MTHFR polymorphisms

**1. Introduction**

Congenital heart defects (CHDs) are common birth defects with a prevalence of confirmed defects of approximately 1:100 living births<sup>(1)</sup>.

CHDs mainly result from incomplete development of the heart during the first 6 weeks of pregnancy. Most CHDs are thought to be of a complex multifactorial origin, with one or more alleles at a number of loci interacting with environmental factors<sup>(2)</sup>.

The most prevalent heart disease in infants and children are atrial septal defect (ASD), ventricular septal defect (VSD), patent ductus arteriosus (PDA) and other types<sup>(3)</sup>.

Observational studies have demonstrated an association between periconceptional use of multivitamins containing folic acid, and CHDs, both conotruncal and other heart defects. Additional support for the importance of folate in CHD risk was provided by Hernandez-Diaz *et al.*,<sup>(4)</sup> their study showed that periconceptional intake of medication acting as folic acid antagonists, doubled the risk for CHDs.

The protective effect of periconceptional folate on CHD has led to the search for candidate genes

involved in its metabolic pathway. Methylenetetrahydrofolate reductase (MTHFR) is a promising candidate because it is a regulating key enzyme for the availability of active folate by catalyzing the reduction of 5,10-methylenetetrahydrofolate into 5-methyltetrahydrofolate. Reduced MTHFR activity results in a decreased availability of 5-methyltetrahydrofolate for the remethylation of homocysteine to methionine. The MTHFR 677C→T polymorphism results in a thermolabile enzyme with reduced activity<sup>(5)</sup>.

Studies regarding MTHFR 677C→T polymorphism in relation to CHD have yielded conflicting conclusions. Junker *et al.*,<sup>(6)</sup> were the first to suggest an association between the incidence of CHDs and MTHFR 677C→T polymorphism. The authors observed a higher frequency of the 677TT genotype versus the combined group of CT and CC genotypes among children (n=114) with a CHD, compared with 228 controls. On the other hand, Storti *et al.*,<sup>(7)</sup> did not observe any association between any fetal MTHFR genotypes (n=103 versus n=200 controls) and the risk of conotruncal heart defects.

The objective of this study was to investigate the effect of MTHFR 677C→T locus polymorphism as a risk factor for cardiac septal defects (CSDs).

## 2. Subjects and Methods

### A. Subjects

From June 2009 to June 2010 all patients presented to the outpatient clinic of Demerdash pediatric hospital, Ain Shams University with CSDs were enrolled in the study. Patients with any genetic or chromosomal disorders that may affect the heart including Down syndrome (DS), patients with any congenital cardiac abnormalities other than CSDs, infants with prenatal history of maternal diabetes, hypertension, and patients with history of exposure to chemicals irradiation or pesticides were excluded. The study population remaining for analysis was 42 patients, median age 1.5 months (range 20 days to 1 year), including 24 males (57.1%) and 18 females (42.9%). Eleven (26.2%) patients presented with isolated ASD, 18 (42.9%) with isolated VSD, 8(19%) with ASD+VSD, and 5 (11.9%) with AV canal (Table 1).

In all cases, diagnosis was confirmed by cardiovascular specialist with classical clinical manifestation and standard imaging procedure (M mode, 2D, colour, pulsed continuous wave echocardiography using VIVID E9 Vingmed Horten, Norway).

From the same hospital 90 age and sex matched apparently healthy infants were selected as a control group. The study was approved by the ethical committee of the institute and informed consent was obtained from all mothers.

In groups, patients and controls, information on maternal use of folate or multivitamins, consanguinity, family history of CHD was obtained (Table 1).

### B. Blood sampling and genotype analysis for MTHFR 677 C→T polymorphism:

Two ml blood was drawn into EDTA treated tubes for analysis of MTHFR 677 C→T polymorphism (known as c.677 C>T, rs 1801133, p.Ala 222-val). Genomic DNA was extracted using QIAamp DNA extraction kit (Cat#51104) and genotyping was performed by (PCR-RFLP) method reported by Frosst *et al.* <sup>(8)</sup>.

Two primers were used for analysis; MTHFR F: 5-TGA AGG AGA AGG TGT CTG CGG GA-3 and MTHFR R: 5- AGG,ACG GTG CGG TGA GAG TG -3. One µL of genomic DNA was amplified in a 50 µl reaction volume containing 5 µl of 10X buffer containing KCl and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, pH=8.7, 1.5mM MgCL<sub>2</sub>, 0.2mM each dNTPs, 0.4 µM primers, and one unit of Taq DNA polymerase enzyme (Qiagen, cat#20123). PCR reaction consisted of initial denaturation at 94°C for 150 seconds followed by 35

cycles at 94°C for 30 seconds, 57°C for 60 seconds, 72°C for 120 seconds and a final elongation step at 72°C for 3 minutes. PCR product of 198bp was analyzed on 1.5% agarose gel electrophoresis. 20 µl of PCR product was mixed with 10 units of HinfI (Promega, Madison) enzyme and incubated at 37°C overnight incubation. The substitution creates a HinfI recognition sequence that digests the 198bp into 175-bp and 23-bp. The MTHFR 677CC genotype had only one band: 198 bp, 677CT genotype had three bands: 198 bp, 175bp and 23 bp, and TT homozygote had two bands: 175 bp and 23 bp.

To ensure quality control, the presence of C→T polymorphism was performed with blinding to case-control status, non-template control and positive/amplification genotype control was included within each experimental run. Ten percent sample cases and controlled was genotyped twice and reproducibility was 100%.

### Statistical analysis

Quantitative variables were reported as mean ± Standard Deviation (SD) number or frequency, median and range, and qualitative variables as number and percentage. The significant level was set at 0.05. Genotype frequencies in patients and controls were compared by  $\chi^2$ -analysis or fisher exact test. The genetic risk on CSDs was assessed by the calculation of Odds ratio (OR) with corresponding 95%-confidence intervals (CI) and correlation coefficient tests were performed. All statistical analyses were performed using Statistical Package for Social Science (SPSS) program (version (16)).

### 3. Results

The resulting (OR) for patients carrying MTHFR 677 C→T mutation was 1.8 (95% CI: 0.86-3.84,  $\chi^2$  =1.48,  $p$  = 0.11) compared to control and the OR for CT genotype for patients was 2.13 (95% CI: 0.97-4.69,  $\chi^2$  =3.63,  $p$  = 0.06) attaining only marginal significance compared with TT and CC genotype in controls (Table 1).

The frequency of CT genotype was significantly ( $P$ = 0.007) higher in patients with AV canal, (OR 1.19 95% CI 1.0- 1.41) when compared with the control group. They also showed higher ( $P$ =0.33) percentage of TT genotype but they did not achieve significance (OR 0.32 95% CI 0.24 - 0.44) (Table 2).

Patients with combined ASD and VSD showed significantly ( $P$ =0.05) higher percentage of CT genotypes (OR 4.68 95%CI 1.03 - 21.31) when compared to the control but they did not showed any TT genotype (Table 2).

There was no statistical significant difference between male and female patients, history of consanguinity and family history (FH) as regards distribution of MTHFR C677T mutation ( $P$  = 0.63, 0.71 and 0.99 respectively).

None of the mothers of our patients had preconceptional folic acid supplementation, vitamin supplements containing folic acid or eating food

fortified with folic acid and Egypt is a non-folate fortified-country.

**Table (1):** Characteristics of patients with CSDs

		Cases	
		N	%
Sex	Male	24	57.1
	Female	18	42.9
Consanguinity (32)	-ve	21	65.6
	+ve	11	34.4
FH (31)	-ve	26	83.9
	+ve	5	16.1
MTHFR GENOTYPE	CC	22	52.4
	TT	2	4.8
	CT	18	42.9
CSD	ASD	11	26.2
	VSD	18	42.9
	ASD+VSD	8	19.0
	AV canal	5	11.9

FH, family history; CSD, cardiac septal defects; ASD, atrial septal defect; VSD ventricular septal defect; AVC, atrioventricular canal

**Table 2:** Distribution of MTHFR genotype in patients with different types of cardiac septal defect

MTHFR genotypes	Cardiac septal defects				Control
	ASD N=11	VSD N=18	ASD + VSD N=8	AV canal N=5	
MTHFR 677TT	0	1(5.6%)	0	1(20%)	9 (10%)
MTHFR 677CT	3(27.3%)	5(27.8%)	5(62.5%)	4(80%)	21(24.1%)
MTHFR 677CC	8(72.7%)	12(66.7%)	3(37.5%)	0	60(63.3%)
MTHFR 677 CT/TT	3(27.3%)	6(33.4%)	5(62.5%)	5(100%)	30(34.1%)

FH, family history; CSD, cardiac septal defects; ASD, atrial septal defect; VSD ventricular septal defect; AVC, atrioventricular canal

#### 4. Discussion:

This pilot study was conducted on the basis of the hypothesis that 677TT and 677CT genotype in the MTHFR gene has an impact on embryonal development of children and infants with CSDs. Consistent with this hypothesis, the frequency of MTHFR 677CT genotype was significantly higher in patients with AV canal and patients with combined ASD and VSD compared to healthy controls in this study. This observation was in agreement with previous studies<sup>(3, 6, 9-11)</sup>.

On the other hand, some studies<sup>(7, 12-14)</sup>, revealed negative results and did not observe an association for fetal and/or maternal MTHFR 677C→T polymorphism with different CHDs. However, some of these studies were heterogeneous with regard to heart defects or were performed in countries where fortification of flour and other enriched grain products with folic acid has been compulsory. In this study we have investigated the estimate risk of one type of CHD, (CSDs) for MTHFR 677CT and MTHFR

677TT genotypes in a non-folate fortified-country, Egypt.

MTHFR 677C→T homozygous genotypes (TT) and possibly the heterozygous mutant genotypes (CT) are more likely to be related to CHD risk in the absence of periconceptional folic acid supplementation. Such an interaction was found by van Beynum *et al.*,<sup>(11)</sup> for the maternal MTHFR 677C→T polymorphism in relation to CHD when the mother did not take folic acid periconceptionally. The maternal MTHFR 677CT and TT genotypes in combination with no use of periconceptional folic acid supplements were associated with, respectively, a three-fold (OR 3.3 95%CI 1.46– 7.32) and six-fold (OR 6.3 95%CI 2.32–17.27) increased risk for conotruncal heart defects in offspring<sup>(11)</sup>.

Previous studies have demonstrated that mothers with the mutation could have a functional folate deficiency even if folate levels are low-normal or normal. In such patients, a superanormal plasma folate

level achievable by high dose folate supplementation might be needed to prevent birth defects<sup>(15)</sup>.

Whether the detrimental effect on the developing embryo is related to the polymorphism in the fetal or in the maternal genotype or both, in the current study, all mothers did not use preconceptional folic acid supplementation which supports the role of gene-environment interaction in a non-folate fortified-country like Egypt and the increase in risk for having offsprings with CSDs.

To conclude, we suggest MTHFR 677CT genotype as a risk factor for AV canal and combined ASD + VSD, and because of the strong relation of this enzyme with folic acid we recommend preconceptional folic acid supplementation and food fortification which might decrease CSDs in Egypt.

However, cardiac development is a very complicated process involving expression of many genes at different times, space and order and our conclusion is hindered by the small sample of children in each septal defect which might lower the statistical power of the study. We acknowledge that these results could be false positive and further studies with a larger cohort are warranted to enable a definite conclusion on the MTHFR 677 C→T polymorphism and CSDs. Nevertheless, we recommend preconceptional intake of multivitamin supplements that contain folic acid which may reduce the risk of congenital cardiovascular defects in offspring.

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## Effect of Aerobic Exercise on HbA<sub>1</sub>C, Serum Insulin Level, C-peptide and Insulin Resistance in Middle-Aged Women with Type II Diabetes

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**Abstract: Introduction :**Diabetes is the most common chronic diseases in addition to creating disability and reduced quality of life for many patients, costs to patients and their families and the community to enter .Major disruption in Type II Diabetes: Role of insulin resistance and secretion is abnormal is that the role and importance of the role of insulin resistance in insulin secretion disorder created by the disease and various complications such as cardiovascular complications, diabetic foot, and kidney failure is identified .The present study surveyed the impact aerobic activities selected eight weeks on glycosylated hemoglobin (HbA<sub>1</sub>c), plasma insulin levels, insulin resistance Peltry c and type II diabetes women . **Methods :**Type of applied research and methods, semi-empirical. Among the 800 female patients with diabetes type II, 30 patients with diabetes type II with age range 40 to 60 year range blood sugar between 150 to 250 mg per dL were selected randomly and divided into two group as control and empirical groups. Selected activities include eight weeks of aerobic exercise for three sessions per week and each session for 50 minutes with intensity of 60 to 70 percent maximum heart rate on the bike and the treadmill was power meter .Before exercise after 12 hours fasting subjects of both groups value 10 ml blood was taken from the elbow vein. Bloodletting second time after eight weeks of aerobic activity, such as the first step was taken. In analyzing data from paired t test was used .Significant level in this study  $p \leq 0.05$  is. **Results :**Selected aerobic exercise on glycosylated hemoglobin hba<sub>1</sub>c Peltry plasma insulin concentration c and create meaningful change. But in reducing insulin resistance was not significant . **General conclusions :** Exercise intensity% 60% 70 HRR in type II diabetes increases in plasma insulin concentration and decrease glycosylated hemoglobin Peptide c (HBA<sub>1</sub>C) is. Diabetes experts are so that the exercise as complementary therapy along with drug treatments to use.

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**Keywords:** diabetic women, aerobic power, aerobic exercises selected physiological factors

### Introduction:

Although researchers precisely do not know how diabetes type 2 develops, there are three important related risk factors including hereditary, obesity and age. Controlling factors such as age and race is impossible, but obesity- the third risk factor in diabetes- is partially controllable. Based on World Health Organization and International Diabetes Federation (IDF) reports, diabetic patients across the world are near to 240 million people and in 2025 will increase to more than 3000 million people. In future decades more than  $\frac{3}{4}$  of all cases will be living in developing countries. Based on Iran's statistics there is 2 million diabetic patients between 25-64 years old in our country.

Recent studies in Swiss and England showing considerable increase in diabetes between young people and its reason is not obvious now. Though remarkable progresses in medicine, curing this disease is not possible and its various complications such as cardiovascular complications, diabetic foot, renal failure and impotency put heavy

financial pressure on patients and healthcare system and cause various problems in patients' lives (1). But there is a difference between diabetes type 2 and other diseases; patient's role in recognizing, controlling and preventing from possible complications is more than a professional physician (2).

For healthy living, a diabetic patient should measure his/her blood glucose level continuously, having appropriate nutrition and regular exercise. Exercise cause fitness, body flexibility, increase muscle tone, improving heart and lung function; also help keeping body weight which can relate to beneficial changes in insulin sensitiveness.

Nowadays, we want to know if continuous exercise in long term can prevent from or delay developing diabetes type 2 in high risk people or at least controlling it. The most important disorder in developing diabetes type 2 is insulin resistance and its abnormal secretion, most studies emphasized that the role and importance of insulin resistance in developing this disease is more than abnormal insulin

secretion (1). As few researches have done about effect of aerobic exercises on insulin resistance, serum insulin level, blood glucose level, C-peptide and HbA<sub>1c</sub> in diabetes type 2 in Iran, we are trying to find if selected aerobic exercises for 8 weeks can improve HbA<sub>1c</sub>, serum insulin level, C-peptide and insulin resistance in diabetic type 2 middle-aged women. HbA<sub>1c</sub> showing the percent of combining blood glucose with hemoglobin in last 2-3 months and high level of it indicates blood glucose average in recent 2-3 months was more (1).

C-peptide has no known biological activity, but always its quantitative level of production and secretion is equal to insulin level (3). At first, insulin produces as a one chain peptide calling pre-insulin, in secreting granules of beta cells divides with a 31 amino acid enzymes calling C-peptide and converts to proinsulin (1, 4). Insulin resistance is a significant sign in obese non-independent insulin diabetic patients. Insulin resistance is when blood insulin level is normal or even increased, but body does not response appropriately to insulin; in other word, insulin resistance is the cell disability to responding to insulin and blood glucose reduction (5).

Insulin is an anabolic hormone producing from beta cells of Langerhans Island of pancreas; this hormone is a small protein playing important role in storing excessive energy (1, 4). Bruce et al (2004) assessed insulin sensitiveness after exercise in diabetic type 2 patients. Their findings showed fast blood glucose is reduced but not significant, though the reduction of serum insulin was significant. Frick and Henricson (2005) assessed the effect of exercise and fatty acid antioxidant on treatment of insulin resistance in diabetes type 2 patients; finding showed exercise improved insulin function in transporting glucose into body muscles (6).

Trawani et al (1984) studied the effect of regular exercise on VO<sub>2</sub> Max, blood glucose control, glucose tolerance and insulin sensitiveness in diabetes type 2 patients. Their plan was consisted of 60 minute exercise for 6 weeks with 50-60% VO<sub>2</sub> Max, which improved insulin sensitiveness by 15% (7). Ritman et al (1984) studied the effect of exercise on glucose homeostasis in diabetes type 2 patients. Their plan included 20-40 exercise, 5-6 times per week for 6-10 weeks with 60-90% VO<sub>2</sub> Max. Findings have shown there is an invert relation between aerobic ability and HbA<sub>1c</sub> and Glucose tolerance test (8).

Ronma et al (1986), in their study with the purpose of assessing the effect of long term physical activity on metabolic control in diabetes type 2 patients, have shown there was significant difference between exercise and control group HbA<sub>1c</sub> after 4-5

months (9). Ewin (2000) assessed the relationship between appropriate physical activities level and stability of insulin level in women aged 40-83 years old. Findings showed physical activity induced 6.6% reduction in insulin level (10).

#### Materials and Methods:

The purpose of this study is assessing the effect of selected aerobic activities for 8 weeks on serum insulin level, C-peptide, HbA<sub>1c</sub> and insulin resistance in middle-aged women with diabetes type 2. This is a practical study and considering the study's limitations has designed semi-experimental which includes pre-test and post-test in two control and experimental groups.

From 800 women with diabetes type 2 referring to Shahid Bahonar's diabetes clinic in Kerman, 30 patients 40-60 years old with diabetes type 2 which their blood glucose was between 150-250 mg/dl have chosen and randomly assigned to two control and experimental groups. After physical assessment, patients voluntarily participated in two groups. Based on previous scheduled program and considering necessarily important factors about diet, physical activity and any disease before beginning exercise, patients have gone to laboratory at 8-10 a.m. They should be NPO for 12 hours and didn't have intense physical activity for 24 hours before the blood sampling.

In laboratory 20 ml blood had taken from elbow's vein of each patient in a sample tube containing anticoagulant, for separating serum from the sample, tubes put in a HeHICH-Rotina35 centrifuge made by Germany. Data from blood samples and patients before and after 8 weeks aerobic exercise analyzed. In order to describe data we used descriptive statistics including mean and frequency charts and tables, and as the data were normal we used paired t-test for testing hypothesis. Data analysis and charts were done with SPSS and Excel software and in this study the significant level was p<0.05.

#### Results:

Selected aerobic exercises has significant effect on HbA<sub>1c</sub> (p<0.029), serum insulin concentration (p< 0.005) and C-peptide (p<0.007) of patients with type 2 diabetes. But has no significant effect on insulin resistance in diabetic patients (p= 0.969).

Table 1: Comparisons of HbA<sub>1c</sub> (%) mean differences in patients with diabetes pre and post-test

Groups	Stage	Mean±SD	Mean difference±CV	t-test
Control	Pre-test	8.68±1.53	0.46±232	t=-1.988 p<0.029
	Post-test	8.69±1.48		
Experimental	Pre-test	8.33±1.50		
	Post-test	7.88±1.31		

Table 2: Comparisons of serum insulin (ulu/ml) mean differences in patients with diabetes pre and post-test

Group	Stage	Mean $\pm$ SD	Mean difference $\pm$ CV	It-test
Control	Pre-test	10.26 $\pm$ 8.25	7.46 $\pm$ 2.65	t=2.816 p<0.005
	Post-test	13.66 $\pm$ 9.33		
Experimental	Pre-test	8.77 $\pm$ 5.05		
	Post-test	19.63 $\pm$ 9.92		

Table 3: Comparisons of C-peptide (ng/ml) mean differences in patients with diabetes pre and post-test

Group	Stage	Mean $\pm$ SD	Mean difference $\pm$ CV	t-test
Control	Pre-test	2.22 $\pm$ 0.39	-0.33 $\pm$ 0.128	t=-2.613 p<0.007
	Post-test	2.19 $\pm$ 0.43		
Experimental	Pre-test	2.31 $\pm$ 0.60		
	Post-test	1.95 $\pm$ 0.58		

Table 4: Comparisons of insulin resistance mean in patients with diabetes pre and post-test

Group	Stage	Mean $\pm$ SD	Mean difference $\pm$ CV	t-test
Control	Pre-test	4.86 $\pm$ 2.61	2.26 $\pm$ 1.55	t=1.959 p<0.969
	Post-test	6.30 $\pm$ 3.31		
Experimental	Pre-test	3.80 $\pm$ 1.82		
	Post-test	7.51 $\pm$ 3.51		

### Discussion:

Aerobic exercises induced HbA<sub>1c</sub> decrease and this reduction in exercise group in comparison with the group without exercise was significant. When the level of blood glucose increases, enters into red blood cells easily and binds to hemoglobin in an irreversible, non enzymatic reaction. Due to the real half-life of red blood cells (30-35 days) and theoretical half-life of them (60 days), blood level of glycosylated hemoglobin is the marker of average of blood glucose in last 1-2 months and its level in patients with diabetes could become 2-3 times more than the normal level.

Glycosylation rate of young red blood cells which circulating in blood for a short time is less than older red blood cells and the reaction of glucose with hemoglobin in first 30 days of their lives is more than next 90 days; and more the level of blood glucose, more the glycosylation rate and HbA<sub>1c</sub>.

Findings of this study showed after 2 months aerobic exercise the level of HbA<sub>1c</sub> decreased significantly, as the natural life of red blood cells for carrying glucose is 30-35 days and the blood glucose level of diabetic patients changing, so the level of HbA<sub>1c</sub>, insulin resistance and serum insulin can change. Ronnema et al (1986) declared aerobic exercises with VO<sub>2</sub>Max 70% in a 4 months period could decrease HbA<sub>1c</sub> (9).

Studies showed that HbA<sub>1c</sub> is the main marker of retinopathy progress in diabetic patients and with 10% decrease of its level (8% to 7.2%) the risk of retinopathy progress will decrease 43-45%.

Therefore, exercise can decrease glycosylated hemoglobin and the risk of retinopathy in patients with type 2 diabetes.

In this study, there was significant difference between the decreased level of HbA<sub>1c</sub> in exercise group and control group. Findings of our study is the same as Ronnema et al, Shahlakan et al, Ustiupa et al, Mayorana studies (3, 5, 9, 11). Results showed aerobic exercise has significant effect on C-peptide and insulin concentration and insignificant effect on insulin resistance in patients with type 2 diabetes. Both insulin dysfunction (insulin resistance) and insulin secretion are inducing diabetes type 2. In insulin resistance the ability of up taking blood glucose and restoring it by liver and muscles decrease.

In response to insulin resistance, secretion of insulin increases to save the normal glucose tolerance. Primary the insulin secretion defect is mild and selectively is due to glucose, but it's normal in response to other stimulating factors of insulin secretion like amino acid. The insulin secretion defect progresses and causes insulin insufficiency. Results of our study showed serum insulin concentration after 8 weeks aerobic exercise increased.

Because the exercise intensity was not enough to use the insulin related glucose, it must be taken energy from fat tissue, so the level of serum insulin increased. declared aerobic exercises for 12 weeks caused serum insulin increase and the level of insulin secretion in response to insulin resistance increase to maintain the normal glucose tolerance. By increasing the quantity and function of some hepatic enzymes in glycolysis reactions of liver, insulin increase the usage of glucose and indirectly prevent glucose release in blood. On the other hand, by decreasing the function of hepatic glucose 6-phosphatase, insulin avoids glucose release.

In this study, there was significant difference in the level of serum insulin increase between the exercise group and the group with no activity. Our results is the same as Poirier study and different with Ronnema study (2, 9). At the same time of increasing insulin secretion, the concentration of C-peptide decreased significantly. Decrease of C-peptide concentration which is related to decrease of fat, showing the increase of insulin secretion in beta cells.

### Conclusion:

In this study, insulin resistance increased whereas serum C-peptide decreased. These findings, C-peptide decrease and insulin resistance increase after 8 weeks aerobic exercise, shows the up taking and responding to insulin by cells inclined. In result

insulin resistance increases that could be because of the short period of study and possibly the increase in insulin sensitiveness is related to insulin binding capacity to muscle' cells receptors. Therefor, needs more insulin for up taking excess glucose in blood

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## The effect of aquatic aerobic training on endurance walking in Multiple Sclerosis patients

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**Abstract: Background and objectives:** Multiple Sclerosis is a chronic and debilitating disease of the nervous system that destroys the central nervous system myelin. The experimental evidence demonstrated the positive effects of physical activity on reducing the symptoms of MS patients. The purpose of this study was to assess the effect of aquatic aerobic exercise for two months of endurance training on the water was walking in female multiple sclerosis patients. **Methodology:** This study was a quasi-experimental research that the subjects were 40 female multiple sclerosis patients in Mashhad. Sampling method was simple randomized. They were randomly assigned into two groups; one control group with 20 subjects and one experimental group with 20 subjects. The training program was implemented on the experimental group for 8 weeks, 3 sessions per week at the intensity of 50-60% maximum heart rate. Walking endurance was measured with a 6 minutes' walk test in pre-test and post-test. Data were analyzed by independent t-tests with using SPSS 16. **Results:** No significant difference in walking endurance between the two groups were observed in pre-test step; but there was significant difference in mean of walking endurance between the two groups in post-test step ( $p < 0.001$ ). **Conclusion:** Aquatic aerobic training increases walking endurance in multiple sclerosis patients. Based on the present finding, the therapists may use aquatic aerobic training as a supplementary treatment beside medications for the multiple sclerosis patients.

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**Keywords:** Multiple Sclerosis, aquatic aerobic training, endurance walking

### Introduction

Multiple sclerosis (or M.S) is a chronic progressive autoimmune disease of the central nervous system that affects the brain and spinal cord and characterized by destruction of myelin in nerve cells and scar formation (1) and causes dysfunction in conduction neurological and electrical flows (2). After the trauma disease, it is the second cause of neurological disability in young and middle-aged people. The main cause of this disease is unknown (3, 4). MS disease mainly is common among young adults between 40-20 years old and is common among women almost twice men (5). About 3 million people in the world and almost 40 thousand people in Iran are infected to this disease (5).

Variety of MS symptoms is depend on an area of the central nervous system that is affected and it's different in patients including loss of function or sensation of limbs, general fatigue, muscle weakness, numbness, movement disharmonic and loss of balance, stiffness, pain, depression, autonomic dysfunction, cognitive dysfunction, mood swings, problems with vision, slurred speech and tremor. Fatigue is the most common and most debilitating symptoms of M.S (8 and 9). Melagelu and his colleagues have stated that all MS patients have complained of fatigue (10). According to the

National MS Society of America Strodt suggests that fatigue in MS, is because of the lack of physical and mental ability (9). Fatigue has negative effects on performance, attention and concentration, playing role and quality of life (10) and decreases life satisfaction (11). In addition, increased depression and limited physical abilities lead to or worsen other symptoms of MS (12). Several studies are done on the effect of endurance exercise on gait in patients are infected by MS. Woods done a long-term exercise training program on water on two MS patients and improvement in muscle endurance and gait was observed (13). Also, Cliff and Eshberon have done aquatic aerobic training during 12 weeks on eight patients who are infected by MS that its results showed significant improvement in walking endurance time (14).

Danny and Speldiany et al have studied on effects of an aquatic aerobic training during 8 weeks on 12 MS patients and significant difference in 6-minute walk test was observed (15). Currently, MS is not a eradicate cure and most available treatments, decrease symptoms or slow the progression of disease. Thus, timely detection and diagnosis of this disease and controlling severe effects and uncontrolled development largely prevent it (16). According to positive effect of physical activity on

MS patients, researchers have been attracted to this subject that exercise executive selected in water for 8 weeks to help reduce the symptoms and effects of endurance training on walking in MS patients should be tested and amount of selected exercises in water, walking endurance in MS patients should be specified.

### Materials and Methods:

Current study is a quasi-experimental study. The statistical sample included 100 MS patients that neurologists diagnosed MS in them and all of them are under medical treatment and have medical records in one of the private treatment centers in Mashhad. The sample size for each group was done based on studies results and using comparison average formulas, 40 people were calculated. Subjects have been chosen using available non probability sampling and based on purpose and then divided into two control (n=20) and experimental (n=20).

For implementing study, patients came together in the desired location 2 days before starting a training program and after description on how to exercise, exercise intensity and number of repetitions per session have discussed and then experimental and control groups participated in pretest. At this stage, testing physical disability scale developed by expert neurologists using krotozkeh questionnaire for physical disability scale was recorded and measured and to measure walking endurance, 6-minute walk test was used. The result data was recorded in pretest table. Experimental group exercise program for a period of aquatic aerobic training was done 3 times a week for 8 weeks and 50 to 60 percent of maximum heart rate was applied. Exercise intensity was controlled using heart rate meter during the exercise. After completion of the training period (8 weeks or 24 sessions) at post-test, walking endurance was retested and the results were analyzed. It should be noted that both groups during exercise, consumed drugs. Krotozkeh developed questionnaire for physical disability specifies degree of disease. The questionnaire measures scenarios and various functions of the central nervous system include pyramidal tract function, cerebellar tract function, the function of the brain stem pathways, the function of sensory pathways, intestinal tract and bladder function, performance of visual way and brain function. The comparison will give a score between the 10-0 for the disease MS (depending on the amount of damage to the central nervous system). The more damage, the more score. Physical disability test developed by Krotozkeh has been normalized in Iran (17). To analyze data, for comparison of the original variables (amount of walking endurance)

Mann-Whitney test and independent t test were used. Level chosen to indicate a significant difference is 5%. For data analysis software SPSS version 16 was used.

### Results

According to Table 1, the mean age of subjects was 80/33 years in the control group, compared to 40/30 years for control group and 20/37 years for group. The mean duration of the disease in both groups was 7 years and the mean age at onset in subjects was 30/27 years. 7/36% of participants were single, 3/53% married and 10% divorced. 37.5% of the subjects used AVonex, 7.5% Rebif and 55% Betaferon. Selected aquatic aerobic training on the water has water has a significant effect on endurance walking of MS patients. Table 2 shows statistical parameters of endurance walking variables in two groups according to the pre-test and post-test.

As can be seen, the overall mean and statistical variables into two groups (control and experimental), walking endurance in pre-test is a little different. According to P value of the ANOVA test, the result is that the variance in the experimental and control groups before the training is different. Thus, the independent t-test was also used with unknown and different variance. The results of these tests are presented in Table 3.

Since the significant level of test or P value is equal to 0.958, the difference between walking endurance in these two groups is not significant and experimental and control groups in terms of endurance are walking in the same situation. In the control group, P=0.268 and the experimental group, P=0.001. Therefore, the control group has been not showed a significant difference between pretest and posttest in walking endurance, while in experimental group the difference in error of 0.05 is significant. Accordingly, it can be concluded that endurance training significantly increased endurance walking in the experimental group and these trainings have increased average of endurance walking in this group to 53.867 m and have improved walking endurance in MS patients. Another limitation of this study was the distribution of the age range between 20 to 40 years. Factors such as nutrition, mental problems and family problems, drug type, type of MS, disease duration, and lack of cooperation in some cases are the constraints that are considered. Most studies, including the results of this study suggest that exercise is essential for maintaining the strength and tone muscles and joint movements.

## Discussion

Due to sedentary in MS patients, this study has done with the aim of study on overall effect of aquatic aerobic training in water on endurance walking in MS patients. Physical disability scale developed in the range of 1 to 6 (EDSS). This distribution is the limitations of this study. Another limitation of this study was the distribution of the age range between 20 to 40 years. Factors such as nutrition, mental problems and family problems, drug type, type of MS, disease duration, and lack of cooperation in some cases are constraints that are considered. Most studies, including the results of this study suggest that exercise is essential for maintaining the strength and tone muscles and joint movements. In addition, for the patient's physical health, functional status, quality of life and feelings can be helpful. The benefits of regular aquatic aerobic training in MS patients include increased ability, improved mood, increased endurance and muscle strength and ability to perform tasks of daily living (18). Exercising in water has tremendous value because it increases level of physical fitness. Since the weight of these patients is substantially reduced in the water, water resistance can balance patient body. One of the basic problems in these patients during exercise is to increase body temperature and by increasing temperature, disturbance causes on neural signals and it changes patient's condition and increase their inability. Water has the property that prevents an increase in body temperature. It also increases the supply of oxygen to the brain to

increase and maintain strong muscles, increase and maintain range of motion, muscle control development, reduce muscle tightness and stiffness, increased quality of life and well being, enhance balance and more energy and vitality (13).

Selected aquatic aerobic trainings in the water have a significant effect on endurance in MS patients This result is consistent with the results of Woods' study that was training in the water as a long- time training and its results was to improve muscle strength and endurance (13) and results of Diblots' study that was a resistance training and aquatic aerobic training program continuative 3 times per week for 8 weeks on 37 MS patients and had significant effect on leg strength (19) and results of Sozan Sütöli et al study that was a training program for 6 weeks on MS patients and improved walking in patients relatively (20). It can be noted that the reason was that the duration of the selected training program so that activities can substantially increase their walking endurance levels and is consistent with the results of Marie Roger studies (21). The reason could be that exercise intensity varied with each other.

## Conclusion

Aquatic aerobic training in the water can help MS patients to strength their muscles and increase their walking endurance. Therefore, according to the positive effect of these trainings, the experts can use these trainings as a complementary treatment for MS patients

Table 1- Frequency in patients with Multiple Sclerosis according to age, disease duration and age of onset

Groups	Age (years) Standard deviation ± Average	Disease duration (years) Standard deviation ± Average	Age of onset (years) Standard deviation ± Average
Experimental	37.20±9.41	7.00±5.31	30.45±1.61
Control	30.40±6.51	7.00±4.97	23.80±4.97

Table 2- comparison of the walking endurance in pre-test of two groups of Multiple Sclerosis patients

Groups	Standard deviation ± Average	F	P variance	The mean difference	Independent T test
Experimental pretest	483/133±75/448	0.605	0.444	1.867	T=0.053 P=0.958
Experimental posttest	537/006±94/338				
Control pretest	485/000±99/900				
Control posttest	462/100±117/235				

Table 3- The average change in walking endurance in pre- and post-test groups

Groups	The mean difference	Standard deviation of the differences	Paired t-test
Experimental	22.90	61.394	T=1.180 P=0.268
Control	-53.867	40.082	T=5.205 P<0.001

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## Atrophy of Intestinal Epithelial Cells Subsequent Bovine Johne's disease: A Histopathological Study

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**Abstract:** Johne's disease is chronic enteritis of ruminants caused by the aerobic bacterium *Mycobacterium johnei* (syn. *M. paratuberculosis*). The disease is widely distributed and causes substantial economic losses through death and loss of productivity during the prolonged preclinical stage. The purpose of this study was to determine whether *M. avium* subsp. *paratuberculosis* infection causes atrophy in bovine intestinal epithelial cell atrophy or not. Samples of ileum or ileocaecal tissue from 10 cows were used. Tissues were fixed in 10% formalin solution then were transferred to pathology laboratory of Islamic Azad University. Compatible lesions and acid fast bacilli were previously confirmed by hematoxylin and eosin and ZN staining performed following routine techniques. This effect appeared to require viable bacilli, and exhibit a significant increase atrophic change in epithelial intestinal cells.

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**Key Words:** Johne's disease, Atrophic chronic Enteritis and *Mycobacterium Paratuberculosis*.

### 1. Introduction

*Mycobacterium avium* subspecies *paratuberculosis* (*M. paratuberculosis*) is an organism first observed by Johne and Frothingham in 1895. *Mycobacterium avium* subsp. *paratuberculosis* causes paratuberculosis or Johne's disease, an intestinal granulomatous infection. First recognised in cattle, then in sheep and later in goats, paratuberculosis is found most often among domestic and wild ruminants and has a global distribution. The disease has also been reported in horses, pigs, deer and alpaca, and recently in rabbits, stoat, fox and weasel (Chiodini et al., 1984; Stabel and Stabel, 1995). Under natural conditions, the disease in cattle spreads by ingestion of *M. paratuberculosis* from the contaminated environment. The disease persists after the introduction of infected animals. Infection can be spread vertically to the fetus (Stevens and Czuprynski, 1996) and semen can be infected with the organism (Sung and Collins, 1998). The primary source of infection in calves is milk from infected cows or milk that is contaminated with the faeces of diseased cattle.

The identification of *M. paratuberculosis* is based on its mycobactin requirement and its pathogenicity in the host. Mycobactin dependence has long been used as a taxonomic characteristic for *M. paratuberculosis* because most mycobacteria are able to make mycobactin for themselves. *Mycobacterium avium* subsp. *paratuberculosis*, *M. silvaticum* and some primary isolates of *M. avium* lack this capacity,

however, and require mycobactin to grow in the laboratory. Thus, the mycobactin requirement is not confined to *M. paratuberculosis*; this characteristic exists to various degrees within the *M. avium* group. Clinical signs of paratuberculosis are a slowly progressive wasting and diarrhoea, which is intermittent at first, becoming progressively more severe until it is constantly present in bovines (Stabel, 1995; Stabel and Goff, 1996). Diarrhoea is less common in small ruminants. Early lesions occur in the walls of the small intestine and the draining mesenteric lymph nodes, and infection is confined to these sites at this stage. As the disease progresses, gross lesions occur in the ileum, jejunum, terminal small intestine, caecum and colon, and in the mesenteric lymph nodes. *Mycobacterium avium* subsp. *paratuberculosis* is present in the lesions and, terminally, throughout the body. The intestinal lesions are responsible for a protein leak and a protein malabsorption syndrome, which lead to muscular wasting (Lambrecht et al., 1988; Laochumroonvorapong et al., 1996; Minshall et al., 1995; Sung and Collins, 1998). Clinical signs usually first appear in young adulthood, but the disease can occur in animals at any age over 1–2 years. Within a few weeks of infection, a phase of multiplication of *M. paratuberculosis* begins in the walls of the small intestine. Depending on the resistance of the individual, this infection is eliminated or the animal remains infected as a healthy carrier. The proportion of animals in these categories is unknown. A later

phase of multiplication of the organisms in a proportion of carriers leads to the extension of lesions, interference with gut metabolism and clinical signs of disease. Subclinical carriers excrete variable numbers of *M. paratuberculosis* in the faeces. In most cases larger numbers of organisms are excreted as clinical disease develops. Delayed-type hypersensitivity (DTH) is detectable early in the infection and remains present in a proportion of the subclinically infected carriers, but as the disease progresses, DTH wanes and may be absent in clinical cases. Serum antibodies are detectable later than DTH. They may also be present in carriers that have recovered from infection. Serum antibodies are present more constantly and are of higher titre as lesions become more extensive, reflecting the amount of antigen present. In sheep, there may be a serological response that is more likely to be detected in multibacillary than in the paucibacillary form of the disease. Other mycobacterial diseases and infections, including mammalian and avian tuberculosis, cause DTH and emerging of serum antibodies. It follows therefore that these diseases need to be differentiated from paratuberculosis, both clinically and by the use of specific diagnostic tests. Exposure to environmental saprophytic mycobacteria may also sensitise livestock, resulting in nonspecific DTH reactions. Animals vaccinated against paratuberculosis develop both DTH and serum antibodies. Vaccination is an aid to the prevention of clinical disease, but does not necessarily prevent infection. It also interferes with programmes for the diagnosis and control of bovine tuberculosis. Thus, if it is necessary to attempt a diagnosis of infection in unvaccinated animals, only tests to detect *M. paratuberculosis* in the faeces can be used (Sung and Collins, 1998). In individual animals, especially from a farm in which the disease has not previously been diagnosed, a tentative clinical diagnosis must be confirmed by laboratory tests. However, a definitive diagnosis may be warranted on clinical grounds alone if the clinical signs are typical and the disease is known to be present in the herd. Confirmation of paratuberculosis depends on the finding of either gross lesions with the demonstration of typical acid-fast organisms in impression smears or microscopic pathognomonic lesions and the isolation in culture of *M. paratuberculosis*. The aim of this study was to detect intestinal epithelial cell atrophy in bovine Johne's disease.

## 2. Material and Methods

### 2.1. Analyzed Samples

Samples of ileum or ileocaecal tissue from 10 cows were used. Tissues were fixed in 10%

formalin solution and embedded in paraffin following the standard histological procedures. Compatible lesions and acid fast bacilli were previously confirmed by hematoxylin and eosin and ZN staining performed following routine techniques.

## 3. Results

### 3.1. Slides Interpretation

After obtaining microscopic section from ileum tissue of Johne's disease infected cases, they were examined in the regard of atrophic cell existence. For this purpose, the numbers of atrophic cells were counted in 5 microscopic fields with  $\times 40$  magnification rates. Also, statistical analysis is provided in table and diagram with regard to Mean  $\pm$  SD which have been obtained by T-test for treatment and control groups, respectively. These data demonstrate that always there is significant difference ( $P < 0.005$ ) in atrophic cells numbers between treatment and control groups.

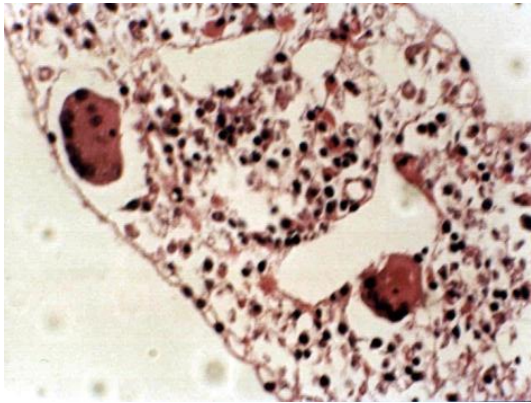
Table 1: number of atrophic cells of ileum in healthy and ill animals

Animals	Mean $\pm$ SD	P-value
Disease	18 $\pm$ 1.79	<0.005
Normal	1 $\pm$ 0.56	

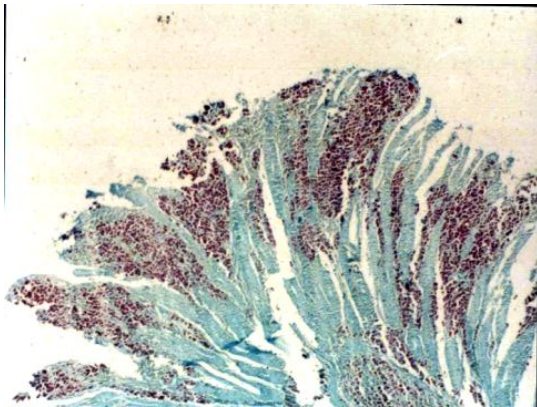
### 3.2. Histopathologic findings

The histological changes in bovine ileum tissue found in Johne's disease are often indistinguishable from those caused by *M. avium* and often similar to those caused by *M. bovis*. Cases 1, 2, 3 and 4 corresponded to animals with severe granulomatous enteritis that showed marked lesions consisting of necrotic and atrophic epithelial cells many macrophages and giant cells spread throughout the mucosa, submucosa, muscle tunic and serosa. Macrophages, with foamy cytoplasm and also epithelioid cells, formed a diffuse infiltrate in the intestinal wall, producing severe thickening of the mucosa, with glands widely separated due to the infiltration. Often, fused granulomas were seen mainly in the villi bodies. Lymphocytes and Langhans giant cells were commonly seen in the epithelioid infiltrate. In most of the sections, intestinal glands were dilated and filled with necrotic debris. The submucosa was severely affected; an infiltrate formed almost exclusively of macrophages with some giant cells was present with edema and thrombus formation. Multifocal granulomas with lymphoid follicles were located in the interfollicular zone. Mononuclear cells infiltrated the muscular layer. The serosa was also affected by the presence of multifocal

granulomatous infiltrates. Lesions were found in the ileocaecal valve in all cases (figs 1 and 2).



**Fig 1:** photomicrograph of bovine intestine tissue, showing granulomatous inflammation and intensive atrophic changes on epithelial cells. H&E, 20X.



**Fig 2:** photomicrograph of bovine intestine tissue, showing leprematous inflammation and intensive atrophic changes on villi epithelial cells. ZN, 10X.

#### 4. Discussion

The primary site targeted by Johne's disease is the lower part of the intestine known as the ileum. The wall of the ileum contains a large number of pockets of lymphoid tissue known as Peyer's patches that lie just beneath the interior surface of the intestine. Peyer's patches are clusters of macrophages and lymphocytes that are organized much like lymph nodes. Covering Peyer's patches are a layer of cells called M cells. These cells function to sample the content of the lumen of the intestines and pass antigens (bacteria) through to the underlying cells of the Peyer's patch to "show" these antigens to the macrophages and lymphocytes (Allen et al., 1967). Unfortunately, when M cells bring *M. paratuberculosis* to the Peyer's patch, the bacteria

find an ideal place for growth. Macrophages in Peyer's patches engulf *M. paratuberculosis* for the purpose of destroying the foreign invader, but for reasons that are unclear, these macrophages fail to do this. Inside a macrophage, *M. paratuberculosis* multiplies until it eventually kills the cell, spreads and infects other nearby cells. In time, other parts of the ileum and other regions of the body are teeming with millions of the mycobacteria. How *M. paratuberculosis* neutralizes or evades the normally efficient bacterial killing mechanisms of the macrophages is unknown, although the unusually resistant cell wall of mycobacteria likely plays an important role (Allen et al., 1967; Gilmour and Gardiner, 1969; Golde, 1968).

The animal's immune system reacts to the *M. paratuberculosis* invasion by recruiting more macrophages and lymphocytes to the site of the infection. The lymphocytes release a variety of chemical signals, called cytokines, in an attempt to increase the bacterial killing power of the macrophages. Macrophages fuse together, forming large cells, called multinucleated giant cells, in an apparent attempt to kill the mycobacteria (Patterson et al., 1967). Infiltration of infected tissues with millions of lymphocytes and macrophages leads to visible thickening of the intestines. This prevents nutrient absorption, and diarrhea results. Late in the infection, antibody production by the animal occurs to *M. paratuberculosis* in serum of animals, and is an indicator that clinical signs of disease and death from the infection will soon follow (Chiadini et al., 1984). For goats infected with this disease, the most apparent sign of having it is their body wasting away, even with a sufficient diet. If a goat develops Johne's and it has diarrhea, it is most likely going to die. When it has diarrhea, the goat is at the last stages of the disease. Herds should be tested once or twice a year to maintain the health and keep out the disease (Molloy et al., 1994).

MAP bacteria enter the intestinal wall through the small intestinal mucosa primarily in the region of the ileum via M cells (specialized absorptive mucosal cells) residing in the Peyer's patches (Allen et al., 1967). Where they are resistant to intracellular degradation, they are eventually phagocytosed by sub-epithelial macrophages (Gilmour and Gardiner, 1969). While the bacteria are in the mucosal tissue and submucosal macrophages, there is little or no detectable reaction to the infection. This delayed detectable humoral immune response is one reason for the poor sensitivity ( $Se$ ) of serological diagnostic tests for MAP, as explained in detail later. Eventually, the infected macrophages migrate into local lymphatics (Patterson et al., 1968), spreading

the infection to regional lymph nodes. In the regional lymph nodes, the organisms are capable of stimulating inflammatory and immunological responses (Golde, 1968). The immune response towards MAP resembles that of other mycobacterial infections. Most animals mount a cellular immune response involving a variety of cells, most importantly T lymphocytes (Larsen et al., 1965). Cytokines produced by T helper cells also contribute to the protective response against mycobacterial infections, especially the cytokine gamma interferon (IFN- $\gamma$ ). Production of IFN- $\gamma$  has been recognized as a key step in resistance against mycobacterial diseases in general, and it may provide a means to help monitor early infection in some animals (Chiodini et al., 1984). In some cows, the cellular immune response has been shown to be able to control the infection, with the cow's never developing clinical signs but remaining subclinically infected for life (Lambrecht et al., 1988). In those animals in which the cellular immunity is unable to control the disease, a detectable humoral immune response will develop, along with increased shedding of bacteria (2). Typically, the organism proliferates slowly in the ileal mucosa and regional lymph nodes. However, poor nutrition, stress related to transport, lactation, parturition, and immunosuppression by agents like bovine viral diarrhoea virus have been proposed as accelerating or precipitating the onset of the clinical phase of infection (Laochumroonvorapong et al., 1996). The physiological mechanism for development of diarrhoea in clinically affected animals is thought to be related to antigen-antibody reactions in infected tissue, with subsequent release of histamine (Patterson et al., 1968; Patterson et al., 1968; Patterson and Berrett, 1969; Patterson et al., 1969; Patterson and Sweasey, 1966). Macroscopic lesions, if present, are seen primarily in the intestine and its draining mesenteric lymph nodes, more specifically in the region of the ileum, although they can occur throughout the whole length of the intestinal tract. The intestinal wall is thickened and edematous, and the mucosa has exaggerated transverse folds, mimicking the appearance of corrugated cardboard with atrophic villi cells. The serosal and mesenteric lymphatic vessels are dilated and thickened. Subsequent muscle atrophy, emaciation, alopecia, renal infarcts, anemia, and leukopenia are thought to be mediated by cytokines (Whitehead and Alleyne, 1972; Patterson et al., 1969).

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## Sociological position of women in the context of cultural development

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**Abstract:** UN Development Plan of 1993 linked the concept of development to human development. UN believes that development should include human dimension. Human development means investment in human abilities and competences through educational and skills development programs. Human development involves providing opportunities for participation. Human participation is the core of UN views (UNDP - 1993). This study examines the relation between female development variables. These variables are female share of or participation in employment, parliament seats, legislature, education, sciences, technology, and health. The variables are studied in the context of female development in Iran and developed countries. This study uses tables provided in UN Human Development Report in search of answers to questions relevant to female development indexes. This study attempts to find the standing of women in Iran and compares it to another country. A sustainable and comprehensive development program requires careful examinations of economic, social, political, and cultural development. The findings of this study indicated that Iran ranked 88 among 187 countries as a developing country based on human development indexes of 2011. Sweden is ranked 10 as a developed country. Sweden was randomly selected from top 25 developed countries for comparison.

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**Keywords:** Development, Human Development Index, Economic Development, Political Development, Social Development, Cultural Development, High Human Development, Medium Human Development.

### Introduction

Development has many definitions and interpretations. The common point in all of them is the establishment of desirable and suitable conditions in a society in support of growth and utilization in all possible dimensions. Development involves changes in the direction of human growth perspectives.

Human resource is one of the main development sources. Women not only make half of this resource, but also take the role of educating and directing both half of this resource. Women have important role in laying the foundation of human development. This role may have positive or negative consequences (Azkia, 1386/2007).

Development sociology or sociological analysis of developing countries may be studied and evaluated versus developed countries. Our objective in this comparison is to find out the Iranian women standing based on UN human development indexes.

### Findings

There are two reasons for the importance of indexes used for economic, political, and status of women.

1. If society fails to utilize the potential contributions of women, it will deprive itself from participation of a half of creative resource in the development process.
2. An employed woman benefits from the sense of satisfaction and identification that come with active participation in the development activities.

She finds opportunities to become familiar with many problems one may face outside home. This activity increases women awareness.

- 2.1. An employed woman feels responsible and respects achievement of social objectives because of being a part of social development.
- 2.2. A woman turns into a serious and determined person with real identity and social status by participating in social activities and accepting responsibilities.
- 2.3. An employed woman participates in decision making, planning, and policy making processes (Abot, 1380/2001).

Women are responsible for cultural development and education. When they are fully aware of their role, they may undertake to educate their children, family, and relatives directing them to become members of a dynamic and active society. An up-to-date woman may play a constructive role and contribute toward social development.

Woman's role in the development of science, technology, and education revealed new realities of human mental qualities. Women turned into practical idealism in an endeavor to reach mental superiority by pushing aside traditional values and qualities. Women started serious changes based on their ideal educational systems in order to achieve their objectives. Humans grow out of family and school system prepared to enter the industrial world.

Quantitative development as industrial needs of the century born out of unrealistic needs became the ultimate activity. Female gender which was once belittled became subject of new evaluation for rational activities (Gidenz, 1386/2007).

The cultural role of women in achieving developmental objectives - In the study of the effective factors in growth of the new sciences, woman is recognized as the center of cultural innovations. Woman can also be considered as an influential element in creation of modern civilization with directed scientific ethic. The reality is that women responsibilities have always taken into account the future perspective. Women have safeguarded the basic values. These values can show the potential grounds for social maturity (Faslnameh, 1388/2009).

Education enjoys a special standing. It can improve human capabilities including knowledge, skills, power, and self-confidence. Education is a prerequisite for active and effective participation of individuals in a society.

#### **Indirect Role of Women in Social Maturity**

- 1- Women devote themselves to families. They focus their activities to achieve higher efficiency.
- 2- Women facilitate cooperation and communication among family members through provision of tranquility and peace. They provide a ground for the development of hidden talents of family members.
- 3- Women learn to perform the basic and long term activities such as education with no immediate outcome. These activities are continual and infrastructural although their outcome may not be observed during one's lifetime.
- 4- Women rely on no economic motivations for their activities.
- 5- Women are the main protector of tradition and values. They undertake to defend human respect.
- 6- Women assist men in their endeavors to conquer the frontiers of science and technology. Women act as men's partners facilitating a platform for their success by providing cooperation and collaboration.
- 7- Women play as the critical link to culture. They may play a differentiating role in cultural arena. Women are carriers and interpreters of culture. Realization of gender equality has an inseparable connection with identity and power.

#### **Conclusion**

The results of developed countries are compared with the results obtained for Iran as a developing country. Sweden was randomly selected out of 15

top developed countries for comparison. UN Human Development Report of 2011 was used as the base for the comparisons carried out in this study.

#### **1- Women's Role in Economic Development**

Percent of participating women in economic activities

Sweden: 62.5%                      Iran: 29%

#### **2- Women's Role in Economic Development**

Percent of parliament seats taken by women:

Sweden: 45.3%                      Iran: 4.1%

#### **3- Women's Role in Social Development**

Life expectancy at birth:

Sweden: 83%                      Iran: 71.2%

#### **4- Women's Role in Cultural Development**

Elementary, intermediary, and high school enrolment index:

Sweden: 95.3%                      Iran: 72.8%

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## Women's Satisfaction with the Quality of Antenatal Care at the Primary Health Care Centers in Al-Madinah Al-Menawarh, KSA

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**Abstract: Background:** Antenatal care dramatically reduces infant and maternal morbidity and mortality. Early detection of potential problems leads to prompt assessment and treatment which greatly improves the pregnancy outcome. However, the quality of antenatal care and the availability of essential obstetric care are important for antenatal care to be effective. It is also being increasingly recognized that client's satisfaction should be taken into account as part of the assessment of quality of care. **Aim:** The aim of this study was to assess women's satisfaction with the quality of antenatal care at the primary health care centers in Al-Madinah Al-Menawarh, KSA. **Methodology:** Research design used for the study was a descriptive design. A simple random selection of six primary health centers which affiliated to the Ministry of health was done. The study subjects were 150 pregnant women attending the previously mentioned primary health care centers. An interviewing assessment sheet was designed by the researchers to collect the data. **Results:** More than two thirds of the clients (68.0%) and slightly less than two thirds of the them (62.0%) respectively were very satisfied with provider-client interaction and quality of antenatal care services. In addition, It can be observed that the older, low educated, housewives women and those who had small number of children were more satisfied with health care providers ' interaction and the quality of antenatal care services provided to them. However, the difference observed was statistically significant. **Conclusion:** It can be concluded from the results of the present study that although the overall satisfaction with the quality of antenatal care was high, some aspects of provided antenatal care were inadequate. Health care providers should work towards improving their technical competence.

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**Key words:** women's satisfaction, quality of antenatal care

### 1. Introduction

Antenatal Care (ANC) means “care before birth” and includes education, counseling, screening, treatment, monitoring and promoting the well-being of the mother and fetus<sup>(1)</sup>. The death of a mother during pregnancy or delivery is a tragedy that affects not only families but society as a whole<sup>(2)</sup>. The risk of dying during pregnancy or delivery is 175 times higher for African women than it is for women in developed countries<sup>(3)</sup>. At the global level, 13 underdeveloped countries account for 70 per cent of maternal deaths<sup>(4)</sup>.

In spite of international efforts to improve maternal health in the developing countries, the present quality of maternal care as depicted by the magnitude of sever maternal mortality and morbidity in this region makes the realization of the Millennium Development Goal for maternal health uncertain<sup>(5,6)</sup>. However, while poor access to basic antenatal care is recognized as a major obstacle toward improvement of pregnancy outcomes, there is a growing consensus that access to antenatal care alone is insufficient to

alter the present maternal health profile and that the quality of antenatal care services may be a key determinant of maternal and perinatal outcomes<sup>(7,8)</sup>.

Quality of health care can be accessed from two perspectives, quality of health care and clients satisfaction with the manner in which the service is delivered<sup>(9)</sup>. Some empirical evidence suggests that patient's quality of judgment may be positively associated with technical quality. So, any successful health care program should achieve client satisfaction<sup>(10)</sup>. Satisfaction can be defined as the extent of a client's experience compared with her expectations. Evaluation of client satisfaction with antenatal care services is clinically relevant, as satisfied women are more likely to comply with treatment, take an active role in their own care, continue using the services and stay with the health provider<sup>(11)</sup>.

### Significance of the study:

Maternal mortality ratio in Saudi Arabia in 2009 was 15 deaths/100.000 live births. Maternal mortality

associated with preventable patterns are late detection of complications associated with pregnancy, late arrival to a medical centre and delayed quality care provided to pregnant women<sup>(4)</sup>.

In spite of increasing importance of quality of antenatal care worldwide, accurate information about the quality or efficiency of antenatal care practices and clients satisfaction with such care are less often available or investigated in many countries where they are most needed<sup>(3,12)</sup>. For instance in Saudi Arabia, where reducing maternal mortality rate is one of the main goal of MOH (Ministry Of Health) and the central role of primary care centers, little is known about the satisfaction of women with the quality of care provided by primary health care centers<sup>(13,14,15)</sup>.

#### **Aim of the study:**

The aim of this study was to assess women's satisfaction with the quality of antenatal care at the primary health care centers in Al-Madinah Al-Menawarh, KSA.

## **2. Subjects and Methods:**

### **Design, setting and subjects:**

Research design used for the study was a descriptive design. A simple random selection of six primary health centers which affiliated to the Ministry of health was done. These centers were Alsalam, Elegaba, Alnars, Albiaa, Alaws, and Alkandk. The study subjects were 150 pregnant women attending the previously mentioned primary health care centers. The sample will be divided as follow: 25 pregnant women was selected randomly from each center.

### **Tools of data collection:**

Tools used for data collection consisted of: An Interviewing Assessment Sheet: A structured interview data collection form was designed by the researchers which was derived from the policy series in reproductive health that produced by the reproductive health working group housed in the Population Council<sup>(16)</sup>.

### **The interview form consisted of three parts:**

**Part I:** was concerned with socio demographic data and obstetrical history such as age, level of education, occupation, number of children, and client's amenities in the primary health centre...etc.

**Part II:** was concerned with provider- client relationship. It consisted of closed ended questions related to causes of visits, women's greeting by health care providers during the visits and their communication with women.

**Part III:** was concerned with health care services provided to the pregnant women during the visit (history taking, examinations and investigations) for example: if a health care provider asked the woman about her obstetrical, medical history, her previous delivery, performing general and local examination to the women, making investigations to the women and giving her the required vaccination and vitamins.

### **Administrative design:**

Collection of data were done after obtaining the formal permission from the ethical committee of the directors of primary health care centers at Al-Madina Al-Menawarh. An official letter clarifying the purpose of the study and accepting the process of data collection was directed from the head of committee to the manger of each selected center.

### **Pilot Study:**

The study tool was pre-tested on a random sample of 20 pregnant women who were excluded from the study sample and obtained from 2 centers to assess the reliability and applicability of the tool.

### **Procedure:**

The researchers attended one of the selected primary health care centers two days per week, from 8.00 am. to 12.00 pm. The researchers introduced themselves to the selected women and briefly explained the nature of the study. Then women's consent was obtained. The field work lasted for three months. It started from April 2012 to June 2012. All women were interviewed to collect data and each interview was taken from 30-45 minutes with each woman with a weekly interview of about 12-14 women.

### **Ethical consideration:**

Obtaining the acceptance of women to participate in the study. All women were informed that their participation is voluntary and that the collected data would be only used for the purpose of the study, as well as for their benefit.

### **Statistical analysis:**

Data were analyzed using SPSS windows statistical package version 16. Descriptive statistics was used to calculate percentages and frequencies. t test was used to estimate the statistical significant differences. A significant P-value was considered when P-value is less than 0.05 and it will be considered highly significant when P-value is less than or equal 0.01. The scoring system for satisfaction was classified according to the following categories: <25% are very dissatisfied, from 25-50%

are dissatisfied, from 50-75% are satisfied and from 75-100% are very satisfied

### 3. Results

#### Socio-demographic characteristics of the women

As shown in **table (1)** about one half of the women (48.0%) were in the range of age 25-35 years. Less than one fifth of the women (14.7%) were illiterate or able to read & write. Nearly one half of the women (47.3%) had completed primary, intermediate and secondary education. The rest were university and postgraduate holders. It can be observed that 48.7% of their husbands had completed primary, intermediate and secondary education. More than three quarters of the women (84.7%) were housewives. In addition, more than one half of the women (54.0%) had 3 children or less. More than one third of women (38.7%) had the first visit to antenatal clinic during the third trimester.

#### Assessment of amenities at PHCs

**Table (2)** represents women's assessment of amenities at PHCs, most of the women (85.3%) lived near from the centre. Slightly more than one half of them (52.7%) waited for long time before entering to the health care provider. The majority of women (98.7%) mentioned availability of chairs in the waiting area. In addition, 92.7% of women stated the availability of toilets in the centre.

#### Provider –client interaction:

**Table (3)** reveals the interaction between the health care provider and the clients, it can be observed that 96.0% of clients were greeted by the health care providers, 60.7% of them did not know their health care providers because they did not introduce themselves to the clients. Majority of clients (97.3%, 92.0%) respectively were asked about the visit cause and the present health problems. Most of client's complaints (88.0%) were listened carefully by the health care provider.

#### Women's satisfaction with health care provider interaction:

As shown in **figure (1)** more than two thirds of the clients (68.0%) were very satisfied with provider client interaction followed by 22.0% were satisfied and 8.0% were dissatisfied while the rest of clients were very dissatisfied.

#### Antenatal care services provided to the women:

**Table (4)** summarizes the various antenatal care services provided to the women during antenatal visit. Majority of clients (98.0%, 98.0%, 99.3%, 97.3%, 95.3%) respectively were asked about their age, date of last menstruation, number of

pregnancies, number of living children and number of abortions. Moreover, about three quarters of women (74.6%, 76.0%, and 74.0%) respectively were asked about place of previous delivery, type of delivery and consanguinity with their husband. The same table illustrates the different examinations expected to be provided by doctors to the clients during antenatal visit. Most of the clients (92.0%, 95.3% and 96.0%) respectively reported that their body length, weight and blood pressure were measured. Moreover, a minority of women (11.3%, 14.6%, 9.3% and 14.0%) respectively reported that their eyes, teeth, lips and gum were examined. However, less than one half of women (43.3%) mentioned that doctors didn't examine their lower limbs for varicose veins or edema. More than three quarters of women (80.7%) mentioned that their abdomen were examined for palpating fetal parts and position while more than two thirds of them (70.7%) stated that doctors auscultated their fetal heart rate. The same table reveals different investigations and other health care services expected to be provided to the clients. As shown in this table, majority of clients (92.6%, 94.6%) performed blood and urine analysis. In addition, more than two thirds of women (69.3%) stated that their abdomen were be examined by ultrasound. In addition, (33.3%, 95.3%, 74.6%) respectively received tetanus vaccine, iron and vitamin supplementation and instructions about nutrition. Majority of women (92.0%) were informed about the date of next visit.

#### Women' satisfaction with the quality of antenatal care services provided to them:

Concerning the clients' satisfaction with the quality of antenatal care services provided to them, **figure (2)** shows that slightly less than two thirds of the clients and one third of them (62.0%, 33.3%) respectively were either very satisfied or satisfied while 4.7% only expressed dissatisfaction.

#### Correlation between socio demographic characteristics and scores of satisfaction with provider-client interaction and quality of antenatal care services.

As shown in **table (5)** the older, low educated, housewives women and those who had small number of children were more satisfied with health care providers' interaction. However, the difference observed was statistically significant where  $p = 0.021, 0.007, 0.018$  and  $0.025$  respectively. In addition, they were also more satisfied with the quality of antenatal care services provided to them. However, the difference observed was statistically significant where  $p = 0.008, 0.009, 0.005$  and  $0.032$  respectively.

**Table (1) : Socio-demographic characteristics of the women**

<i>Characteristics</i>	<b>No (n=150)</b>	<b>(%)</b>
<b>Age</b>		
15>25	57	38.0
25>35	72	48.0
35>45	19	12.7
45-55	2	1.3
<b>Mean + (SD)</b>	<b>32.3±11.36</b>	
<b>Woman's educational level</b>		
Illiterate /read & write	22	14.7
Primary/Intermediate/Secondary education	71	47.3
University /Post graduate education	57	38.0
<b>Husband's educational level</b>		
Illiterate /read & write	10	6.7
Primary/Intermediate/Secondary education	73	48.7
University /Post graduate education	67	44.6
<b>Employment status</b>		
Housewives	127	84.7
Working	23	15.3
<b>Number of living children</b>		
None	43	28.7
≤ 3	81	54.0
>3	26	17.3
<b>Pregnancy trimester at first visit</b>		
First trimester	47	31.3
Second trimester	45	30.0
Third trimester	58	38.7

**Table (2): Women's assessment of amenities at PHCs**

<b>Amenities</b>	<b>No (n=150)</b>	<b>(%)</b>
Short distance between PHC &client's home	128	85.3
Waiting long time	79	52.7
Availability of chair in the waiting area	148	98.7
Availability of toilets for the clients	139	92.7

**Table (3): Women 's assessment of provider - client interaction**

<b>Provider - Client Interaction</b>	<b>No (n=150)</b>	<b>(%)</b>
Greeting the clients	144	96.0
<b>Health care providers introduced themselves:</b>		
Doctors only	22	14.7
Doctors and midwives	37	24.6
Neither doctor nor midwives	91	60.7
<b>Asked about:</b>		
The cause of the visit	146	97.3
Present health problems	138	92.0
<b>The care providers listen carefully to client's complaints</b>		
Usually	132	88.0
Sometimes	18	12.0

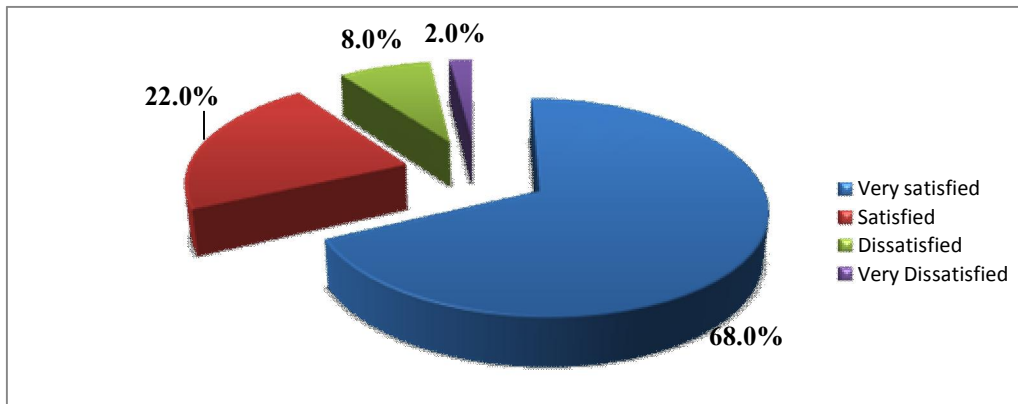


Fig. (1) Women's satisfaction with health care providers interaction with them

Table (4):Antenatal care services provided to the women

Services / procedures	No (n=150)	(%)
<b>History taken</b>		
Age	147	98.0
Level of education	100	66.7
Employment status	104	69.3
Date of last menstruation	147	98.0
Number of pregnancy	149	99.3
Number of living children	146	97.3
Number of abortion	143	95.3
Place of previous delivery	112	74.7
Type of previous delivery	114	76.0
Consanguinity with husband	111	74.0
Measuring length	138	92.0
Measuring weight	143	95.3
Measuring blood pressure	144	96.0
<b>Examination of the:</b>		
Eyes	17	11.3
Teeth	22	14.6
Lips	14	9.3
Gum	21	14.0
Chest	76	50.7
Lower limb for edema and varicose veins	65	43.3
Calculation of expected date of delivery	135	90.0
Abdominal palpation	121	80.7
Auscultation the FHR	106	70.7
Blood investigation	139	92.6
Urine analysis	142	94.6
Ultrasound investigation	104	69.3
Tetanus vaccination	50	33.3
Iron or vitamins supplementation	143	95.3
Nutritional counseling	112	74.6
Appointments of subsequent visits	138	92.0



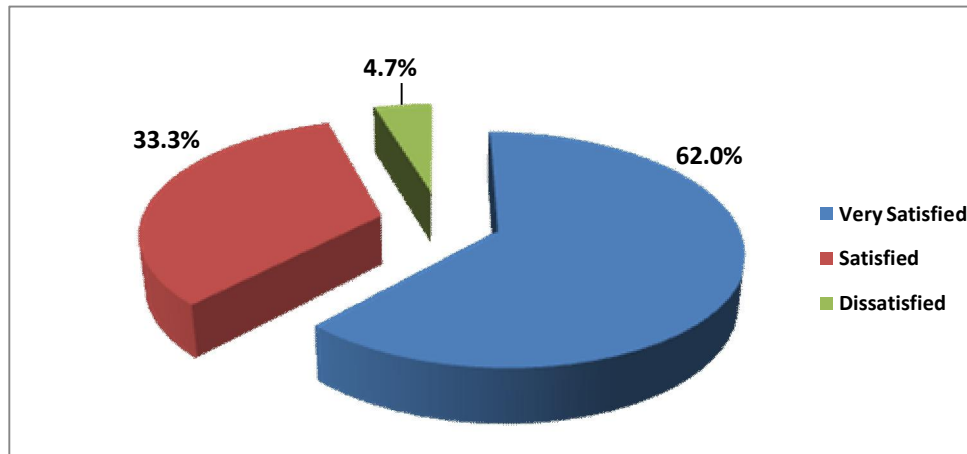


Fig (2): Women's Satisfaction with the quality of antenatal care services provided to them

Table (5): Correlation between socio demographic characteristics and scores of satisfaction with provider-client interaction and quality of antenatal care.

Model	T	P-value	T	P-value
	Satisfaction with provider- client interaction		Satisfaction with quality of antenatal care	
(Constant)	2.808	.0421	3.185	.0239
Age	1.260	.0211*	2.723	.0088*
Woman level of education	-1.077	0.007*	-2.070	.00944*
Husband level of education	1.494	.061	-0.319	.191
Woman work	-2.410	.0183*	-2.648	.00518*
Number of children	-2.569	.02571*	-2.65	0.032*

### Discussion

Ante natal care (ANC) is the key entry point of a pregnant woman to receive broad range of health promotion and preventive services which provide the health of the mother and the baby<sup>(17)</sup>. Quality of ANC is an important determinant of pregnancy outcome and has been designated one of the four pillars of safe motherhood, along with clean and safe delivery, essential obstetric care and family planning which could contribute to reduction of maternal mortality<sup>(18,19)</sup>. Patient satisfaction and dissatisfaction indicate patients' judgment about the strengths and weaknesses of the services<sup>(20)</sup>. The aim of this study was to assess women's satisfaction with the quality of antenatal care at the PHC in Al-Madinah Al-Menawarh, KSA.

As shown in table (1) about one half of the pregnant women were between 25-35 years old. However, this is expected because it is the common and ideal age of childbearing. In addition, most of the clients were educated. It has been noted that in developing countries as a whole, women with secondary or higher education are more likely to

attend for antenatal care than women with no education<sup>(21)</sup>. This result is congruent with the results of (Habib et al 2011)<sup>(13)</sup>. Literacy may denote a greater recognition of the need for the services, and greater ability to make full use of them<sup>(22)</sup>. Illiterate mothers may believe that pregnancy is a normal phenomenon and that there is no need for any specialized care. Moreover, more than three quarters of clients were housewives. This is anticipated because working women may not find the chance to visit the primary health centre especially during working hours. The same table reveals that only less than one fifth of clients who attended the primary health centre had more than 3 children. Having large number of children and caring for them may be one of the barriers for those women for not attending the primary care centre. This result is in line with the result of Shipman et al (2001) who found that 48.9% of telephone callers had expected to be offered a home visit for the same previous reason<sup>(23)</sup>. More than one third of women started ante natal care at the third trimester of pregnancy which is contrary to WHO recommendation of initiation of antenatal care

before sixteen weeks<sup>(24)</sup>. These findings may be due to lack of clients' knowledge about the importance of ANC.

It seems that the distance between the clients' homes and the centers played an important role on the follow up process because most of the women who attended antenatal clinic lived near from the centers (table 2). More than one half of the clients considered the waiting time to enter the examination room to be long. These results may refer to shortage in medical staff compared to the number of clients. However, these findings are not in agreement with Fawole et al. (2008) in Nigeria and Chandwani et al. (2009) in India<sup>(7, 25)</sup>. Moreover, majority of the women mentioned the availability of chairs and toilets in the waiting area (table 2). In contrast to these findings, Mgawadere (2009) reported that women had to wait for the services outside the examination room on the ground due to lack of proper structure besides, there was no specific toilet for antenatal women and they were using a general toilet at the facility which was about 100 meters away from the room used for ANC and was very untidy<sup>(17)</sup>.

In primary health care, provider-client interaction is a fundamental platform and critically affects service delivery. Interpersonal interaction affects the perception of the patients about the provider's competency and consequently their satisfaction<sup>(26)</sup>. In the present study, most of the health care providers were greeting the clients, asked clients about the cause of visits, their health problems and they listened carefully to the clients' complaints (Table 3). As shown in figure (1) more than two thirds of the clients were very satisfied with provider-client interaction, these results are congruent with the results of Hansen et al. (2008) who presented nearly similar ratios<sup>(27)</sup>.

The study revealed that majority of the clients were checked for weight and height (Table 4) and this also reported by Mgawadere, (2009) and Montasser et al (2012)<sup>(17,28)</sup>. In addition, blood pressure was checked for majority of women. This indicated that the health care providers screened for pre-eclampsia. According to WHO (2010b), screening for pre-eclampsia can reduce the risk of maternal death due to hypertension by 48% and neonatal deaths due to prematurity by 15%<sup>(29)</sup>. Examinations of the eyes, teeth, lips, gums, lower limbs were the tests least often performed. These results are in line with Habib et al (2011)<sup>(13)</sup>. Such missed examinations should be regarded as indicators of poor quality. However the finding could be due to lack of staff orientation about ante natal care, Inadequate staff training and lack of refresher courses to upgrade staff skills. In addition, a few minutes spent with the health care provider particularly when

coupled with staff shortages appears to have a negative effect on the content of ante natal services that could be provided. About three quarters of clients or more were checked for fetal heart rate and fetal position (Table 4), these results are supported by Montasser et al (2012) who presented nearly the similar ratios<sup>(28)</sup>.

Majority of the clients performed basic investigations like blood and urine analysis in the health care centers (Table 4). These results may be attributed to more available resources at the primary health centers in Al-Madina Al-Menawarh. However, these results are contradicted by Montasser et al (2012) who found that > 80% of target group didn't perform basic investigations which may be due to lack of experience of physician or unavailable resources<sup>(28)</sup>. Ultrasound examination was reported by more than two thirds of the clients but Tran et al. (2011) in Vietnam found that nearly all attendants in urban areas received ultrasound examination and slightly lower in rural areas<sup>(30)</sup>. This could be due to limited examination time with increased number of clients.

In addition, only one third of the clients received tetanus vaccine, this is due to the strict system of vaccination for mother and child that is carried out by the ministry of health. These results are supported by findings of Nisar and Amjad, (2007) who reported that 75% of women did not have complete tetanus vaccine<sup>(31)</sup>.

Nutritional education and iron supplementation were be reported by large proportions of clients (table 4), this is attributed to the inclusion of nutritional counseling within the antenatal care program. These are in agreement with Tran et al (2011), Mgawadere (2009) who found that about 80% of the women received iron supplementation and Khadr (2009) who found that 64% received iron<sup>(17,30,32)</sup>. These results are contradicted by El-Kak et al. (2004) in Lebanon who found that only one-third of women were given diet recommendations<sup>(33)</sup>.

The overall clients' satisfaction with the quality of ante natal care services provided to them was relatively high (Fig.2), this result is supported by other studies which were carried out by Al-azmi et al (2006), Al-Eisa et al (2005) and Al-Faris et al., (1996) that showed a higher overall patients' satisfaction with Riyadh health centers (90%)<sup>(34,35,36)</sup>.

The relationship between socio demographic characteristics and clients' satisfaction with provider-client interaction and quality of antenatal care provided to them was investigated in the present study. The older, low educated, housewives women were more satisfied with client-provider interaction and with the quality of antenatal care (Table 5). However, the expressed satisfaction in this study may

be due to lack of client's knowledge about care they could expect at the antenatal clinic. In addition, the literature appears to support this in that older women expected less information from their doctors<sup>(35)</sup>. These findings are in agreement with Al-azmi et al (2006), Al-Doghaiter in Riyadh (2004) who found that the oldest group of respondents were more satisfied with the primary care services than younger<sup>(34,37)</sup>. In addition, Babic et al (2001) reported that less educated patients were generally more satisfied<sup>(38)</sup>.

#### Conclusion:

It can be concluded from the results of the present study that although the overall satisfaction with the quality of antenatal care was high, some aspects of provided ante natal care were inadequate. In addition, the present study showed that good communication with the clients significantly influence patient satisfaction. Therefore, health care providers should work towards improving the communication skill of their professionals along with having technically competent work. It is also evident that the lower educated and housewives women were more satisfied.

#### Recommendation:

Based on the findings of the present study, the following recommendations are suggested:

1. Enhance strategies to increase the health care worker knowledge and improve training courses of the providers to upgrade their communication and counseling skills.
2. Government should recruit large numbers of qualified health care providers to decrease work load on the staff and to increase the examination and consultation time.
3. Ministry of health should provide more flexible working hours of primary health care centers to provide more opportunities for working women to attend the clinic.
4. Patient satisfaction surveys should be carried out routinely in all aspect of health care to improve the quality of services.
5. Different health education methods should be available to increase awareness of the women about the importance and components of antenatal care.

#### For further research

6. Further studies should be carried out to examine obstacles that face health care providers in their work place, their suggestions for improving antenatal care and their job satisfaction.

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**Matricellular proteins: Recombinant expression of Smoc2 and Periostin in vascular cells**Mohammadhossein Hassanshahi<sup>1</sup> Dr. Ernst Poschl<sup>2</sup>

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**Abstract:** Extracellular matrix (ECM) proteins are a large family of macromolecular proteins which play crucial role in a wide range of biological activities such as cell adhesion, migration, proliferation, survival and differentiation. Matricellular proteins are a novel group of ECM proteins which are postulated to have regulatory activities and modify the features of ECM and reactivity of cells. This project aims to investigate the role of two new members of matricellular proteins namely: Smoc2 and Periostin. Both proteins should be expressed and recombinantly purified and initial attempts need to define their biological functions. For this purpose, different cell types were used such as two types of pericyte-like cells (PVC cells): PVC/MI (Anxa5<sup>LacZ/LacZ</sup>, knock out) and PVC/MII (Anxa5<sup>+LacZ</sup>; heterozygote) and HEK-293 (Human embryonic kidney). The results indicate that Smoc2 and Periostin can be expressed and purified from HEK-293 cells. In contrast, transfection and expression in pericyte-like cells was very inefficient. Therefore, Smoc2 and Periostin proteins can be expressed and purified after improvements of transfection protocols and optimisation of experiments. Apart from expression and purification of proteins, initial experiments showed more effects on endothelial differentiation and cell binding capacities, but as both proteins can be expressed future investigation are require.

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**Keywords:** Recombinant expression, Extracellular, purification, Matricellular

**1. Introduction**

Proteins are essential component of the body which consist of polypeptides. Each protein is composed of unique chain of amino acids and playing biological role accordingly. Extracellular matrix proteins (ECM) are a well-known member of protein family which consists of approximately 300 different proteins with broad spectrum of activities (Hynes and Naba, 2012). Extracellular matrix proteins (ECM) confer not only structural support to tissue, but also are involved in key biological functions such as cell proliferation, adhesion, survival, migration and differentiation (Daley et al., 2008).

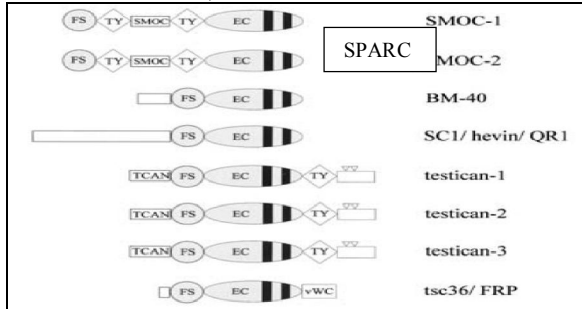
Matricellular proteins are a novel group of ECM proteins and defined as a family of protein involved in the modification of ECM reactivity (Bornstein and Sage, 2002). They bind to cell-surface receptors, growth factors and cytokines, resulting in modulating cell-matrix interactions and modification of features of the ECM proteins, as well as modification of the reactivity of cells (Bornstein and Sage, 2002). Matricellular proteins consist oftenascins, SPARC family (secreted protein acidic and rich in cysteine/osteonectin), osteopontin and thrombospondins (Rocnik et al., 2006). It has been stated that matricellular proteins are over expressed in tissue remodelling, wound healing and embryogenesis (Rocnik et al., 2006). Matricellular proteins through their regulatory effects on growth factors, MMP and ECM activity, stimulate adhesion of cells which leads

to signalling by growth factors receptors (GF-Rs) and integrins. matricellular proteins have been brought to attention in terms of their role in interaction with cells and ECM as a regulator.

SPARC (secreted protein acidic and rich in cysteine/BM40/ osteonectin) is the best analysed member of matricellular proteins which mediate interactions between cell and matrix (Lane and Sage, 1994). Other members of the protein family with related function are thrombospondins (TSP) 1 and 2, osteopontin (OPN), tenascins (TN)-C and X, and the SPARC-related proteins, SC1 and QR1 which are structurally distinct, but also modify the function of ECM components (Brekken and Sage, 2000). SPARC binds structural matrix proteins (e.g. vitronectin, collagen) and modulate interaction between ECM and the cells by modifying the features of ECM and reactivity of the cells (Brekken and Sage, 2000).

Smoc2 (SPARC-related modular calcium-binding protein 2) is a member of SPARC-related proteins (Rocnik et al., 2006) with not fully understood functions in biological activities (Liu et al., 2008). An important property of SPARC-related proteins is the presence of a C-terminal extracellular calcium-binding domain with two EF-hand calcium-binding motifs and a follistatin-like domain (Rocnik et al., 2006). Smoc1 and Smoc2 are almost structurally the same, whereas other related proteins have less or additional domains (Figure 1). Smoc2 protein is believed to play a critical role in cell migration, angiogenesis, proliferation and

growth factor signalling (Pazin and Albrecht, 2009). Due to interactions between Smoc2 and integrins ( $\alpha\beta1$  and  $\alpha\beta6$ ), it has been suggested that interactions between ECM and integrins are mediated by Smoc2 (Pazin and Albrecht, 2009). More importantly, Smoc2 can have angiogenic and mitogenic influences owing to interact with growth factors (VEGF, PDGF and FGF) (Liu et al., 2008; Rocnik et al., 2006).



**Figure 1: Domain organization of SMOC-2 and related proteins.** Differences in structure of Smoc2 and Smoc1 proteins with SPARC family of proteins, as well as other matricellular proteins (Vannahme et al., 2003).

Periostin is a 90kDa secreted cell adhesion protein which is expressed in connective tissues such as skin and bone (Hamilton, 2008). Periostin consists of an amino-terminal EMI domain, a tandem repeat of 4 Fas I domains, and a carboxyl-terminal domain including a heparin-binding site at its C-terminal end (Kudo, 2011). Due to effects of Periostin on collagen fibrillogenesis, it is assumed that Periostin is associated with characteristics of connective tissues in health and diseases (Hamilton, 2008). It is indicated that Periostin binds to  $\alpha\beta3$  and  $\alpha\beta5$ , inducing cell motility (Gillan et al., 2002). As a result, Periostin is considered as a putative protein to promote angiogenesis (Morra and Moch, 2011).

Angiogenesis is the development of new vessels originating from pre-existing vascular system (Longo et al., 2002). It plays crucial roles during embryogenesis, wound healing and reproductive function in adult (Folkman, 2007). Misregulation of such process is involved in wide range of diseases such as psoriasis, cancer (Bisht et al., 2010), diabetes (Kolluru et al., 2012), and age-related macular degeneration (Bressler, 2009). There are various molecules and pathways involving in angiogenesis. Different growth factors (Ruegg and Mutter, 2007), and cell signalling (Kuhnert et al., 2011; Siekmann et al., 2008; Thurston and Kitajewski, 2008), cell-cell interaction (Chantraine et al., 2006; Tan et al., 2009) and cell-ECM proteins interaction (Fiedler and Eble, 2009; Saharinen and Alitalo, 2011; Taneja et al., 2010), are well known factors and pathways which are involved

in angiogenesis (Fig. 6). In angiogenesis point of view, the ECM is identified as storage of pro-angiogenic factors (Schultz and Wysocki, 2009), so that for instance, deficiency of basement membrane proteins (eg, collagen IV) leads to vascular defects (Poschl et al., 2004). Interactions between endothelial cell and mural cells are critical in angiogenesis. It has been indicated that specialised cell-cell contacts are formed as the result of contact between endothelial cells and vascular pericytes in vivo (Diazflores et al., 1992). Furthermore, close contact of endothelial cells and pericytes results in stability of the endothelial tube, increase survival of endothelial cell and regulate hemodynamic processes (Zhou, Z. et al., unpublished). Requirement of pericytes to vascular endothelium triggers chemical and physical signalling with endothelium (Hall, 2006).

As mentioned before, matricellular proteins modulate and modify feature of ECM proteins and cells. Therefore, it is speculated that matricellular proteins, like Smoc2 and Periostin may have interaction with vascular cells or may be considered as regulators of angiogenesis. With this regard, this paper aims to try to: detect expression of Smoc2 and Periostin proteins in tissues and cells, recombinant expression of Smoc2 and Periostin proteins, purify recombinant proteins, evaluate functional studies of Smoc2 and Periostin proteins by using expressed and purified recombinant proteins.

## 2. Materials and Methods

### 2.1. Immunofluorescence staining

#### 2.1.1. Immunofluorescence staining of tissue

To find distribution of Smoc2 and Periostin in tissue, a slide with four 10 $\mu$  sections was chosen (Taken from a mouse with Pdgfrb-Cre: Rosa26-LacZ genotype; mouse was provided by Ulrike Mayer and sectioned by Ernst Poschl). Sections were fixed with 1% PFA/PBS for 10 min, washed with PBS and fixed again in methanol in -20°C. They were blocked in 5% NDS/PBS for an hour. First antibody was anti-Smoc2-pAb IgG/Goat (1:25) and NG2 PG-pAb/Rabbit (1:200) for first section, anti-Smoc2-pAb/Goat (1:25) and Nidogen-1 pAb/ Rabbit (1:500) for second section, anti-Postn-pAb/Goat (1:25) and NG2 PG-pAb/Rabbit (1:200) for third section and fourth section was used as a control of staining (no first antibody was used). After overnight exposing to first antibody, sections were washed 3 times with PBS and treated with secondary Abs: Donkey-anti goat-cy2 and Donkey-anti rabbit-cy3 and DAPI (all 1:200) for four sections for an hour. Secondary antibodies were centrifuged and kept in dark before apply. Tissue was observed after applying mounting solution.

#### 2.2. Immunofluorescence staining of the 3D monoculture

First, collagen gels were washed with PBS, and then fixed with 80% methanol/20% DMSO for 2 hours. Gels then were rehydrated to PBS: 50% methanol/PBS, 20% methanol/PBS and 0.1% Tween-20/PBS (each 1 hour). They were blocked 2 times each 1 hour in 10% Normal donkey serum in PBS, followed by exposing them to the first antibody in blocking reagent (Mouse-anti human CD31, 1:500) (BD Pharmingen) overnight at 4°C. Then they were washed 7 times each 1 hour with TBS/0.1% Tween-20 and again treated with secondary antibody in blocking reagent for (Goat-anti –rat-Cy2) 48 hours. The initial washing step included DAPI (HOECHST 1:500). Finally they were prepared to be observed with dropping mounting solution on the gels.

### 2.3. Plasmid Transformation

Plasmids were already constructed in order to be transformed to the bacteria (DH5 $\alpha$ ) and to have sufficient amount of plasmid for transfection of cells and gaining recombinant expression of Smoc2 and Periostin.

Briefly, 1 $\mu$ l of each pcDNA/His-mCherry-Smoc2-4.3 and pcDNA/His-mCherry-Postn1 was mixed with 50 $\mu$ l of DH5 $\alpha$  in two separate tubes and were incubated for 30min on the ice, for 40 sec at 40°C in a water bath and incubated again on the ice for 2 min and added to LB for 60 min in shaking incubator at 37°C. 15 $\mu$ l of cells/LB were cultured on LB/Amp plates and kept at 37°C for an overnight. One colony of each plate was picked and added to 5ml LB medium for 4 hours incubation and shaking at 37°C. Next the culture was added to 250ml LB with 250 $\mu$ l 1000 $\times$ Amp which followed by 24 hours incubation and shaking at 37°C.

### 2.4. DNA isolation

To isolate DNA, procedure was done according to QIAGEN Plasmid Purification Protocol. Grown bacteria in LB/Amp were centrifuged at 6000rpm for 15 min at 4°C, then supernatants were discarded and 8ml of Buffer P1 was added to the pellets. Next, 8 ml of Buffer 2 was added which followed with inverting and incubation at room temperature for 5 min. 8 ml of Buffer 3 was added and followed with inverting and incubation for 15 min was done. They were centrifuged twice for 30 min and 15 min (20000 rpm) at 4°C. The columns were equilibrated with 4 ml

Buffer QBT and then supernatants were applied to the columns and washed 2 times with Buffer QC and eluted with 5ml Buffer QF. For precipitating DNAs 3.5 ml isopropanol was mixed with eluted DNAs and were centrifuged for 30min (15000) at 4°C. After discarding the supernatants, 2ml 70% ethanol was added to the pellets and again centrifuged with the same condition. The supernatants were discarded and after pellets were air-dried, pellets were dissolved in 500 $\mu$ l of TE buffer. Microspectrophotometry showed the concentration of 856ng/ $\mu$ l and 590ng/ $\mu$ l for pcDNA/His-mCherry-Smoc2-4.3 and pcDNA/His-mCherry-Postn1.

### 2.5. Restriction map

Reactions were prepared according to supplier's recommendation (Roche) with 0.5- $\mu$ g of DNA plus an appropriate buffer (0.5- 1 $\mu$ l) in a total volume of 20 $\mu$ l.

### 2.6. DNA- Agarose Gel

1 % agarose gel was prepared for DNA analysing according to supplier's recommendation (Roche).

### 2.7. Cell culture

During conducting the project, three different types of cells were cultured for investigations:

HEK-293 cells, PVC/MI and PVC/MII cells. All types were usually plated in 10cm plate and in 10 ml of 10%FCS/DMEM. Once the cells became confluent, they were washed with PBS and for detaching cells; 1ml of trypsin was applied to do so. To stop trypsin functions, 5 ml of 10%FCS/DMEM was added to the trypsin. Cells then were centrifuged (1000 rpm) and dissolved in adequate amount of 10% FCS/DMEM and replated 1:5 in 10 cm plate with 10 ml of 10%FCS/DMEM.

### 2.8. Transfection

To see whether cells (HEK-293 cells, PVC/MI and PVC/MII cells) can express the recombinant proteins and also for collecting the conditional medium for purification, all three type of cells were transfected with pcDNA/His-mCherry-Smoc2 and pcDNA/His-mCherry-Postn. For this purpose different methods and approaches were used.

#### 2.8.1. jetPRIME® method

Procedure was followed according to supplier's recommendation (Roche) (Table 1).

In a 6-well plate 150,000 PVC cells were plated in each well before transfecting the cells. Procedure briefly is provided below:

**Table 1: Briefly jetPRIME® method which was applied for PVC cells, according to Roche.**

wells	Jet Buffer ( $\mu$ l)	DNA ( $\mu$ g)	Vortexing 1 sec	Jet Prime ( $\mu$ l)		
control	1	200			Vortexing 1 sec, followed by centrifuging for 1 sec and keeping 10 min at RT	
	2	200				
Smoc2	3	200		1		2
	4	200		2		4
Postn1	5	200		1		2
	6	200		2		4

Cells were incubated an overnight at 37°C and 5% CO<sub>2</sub>.

### 2.8.2. Other methods which were employed to transfect the cell

Apart from jetPRIME® method, other methods for transfection cell FuGENE® 6 Transfection Reagent, Lipofectamine™ Reagent and calcium-phosphate were applied to transfect the plasmids to the cells. However, they were not as effective as jetPRIME®.

### 2.8.3. Selection of transfected cells

In order to select just transfected HEK-293 cells, usually 250ug/ml to 500ug/ml of G418 (50mg/ml) were regularly added to their media. For selection of transfected PVC/MI, we also treated them with 400ug/ml of G418 from the same concentration.

### 2.9. Collection of serum-free and 10% FCS containing media from HEK-293/His-mCherry-smoc2

Conditioned media (serum-free and serum-containing media) were regularly collected in 50 ml tubes and kept at -20°C.

### 2.10. Protein purification

To purify the proteins from either serum free or serum-containing media and detect the interested recombinant proteins, purification of medium was performed according to Clontech (TALON Affinity chromatography).

Collected media adjusted to 300 mMNaCl and 50 mMNaphosphate. On the other hand, 3ml of TALON Resin was poured in a column and equilibrated with 1× equilibration buffer (50mM Na phosphate pH: 8 and 300mM NaCl). Then, adjusted medium was added to the Resin. Resin was washed with washing buffer (equilibration buffer plus 15mM imidazole). Following step was adding elution buffer (equilibration buffer+ 150mM imidazole). Finally, eluted proteins were collected in 15 fractions each 1ml and they were kept in fridge.

### 2.11. Protein analysis

In order to detect the recombinant proteins either in eluted protein fractions or directly from collected serum-free and serum-containing media, they had to be precipitated and prepared to be run on polyacrylamide gel for immunoblotting and chemiluminescence assay.

#### 2.11.1. Protein precipitation

1 ml of aliquots were mixed with 139ul 1%Triton X-100 and 259ul 55%TCA which followed by 15 min incubation on the ice, then 15 min centrifugation in 4°C (13000 rpm), washing with cold acetone and again 15 min centrifugation in 4°C (13000 rpm). After removing the organic waste, the pellets were left at room temperature to be air-dried and were dissolved in 100ul 1×SDS-loading buffer). However, for subjecting to the electrophoresis gel 25ul of each was used to do so.

#### 2.11.2. Polyacrylamide gel

To do western blot and analysis of proteins, precipitated proteins were run on either 8% or 10% polyacrylamide gels. Gels were made in according to supplier's recommendations (Roche) (Table2):

**Table 2: making 8% and 10% polyacrylamide gels according to Roche.**

Material	%8 polyacrylamide gel (15ml)	%10 polyacrylamide gel (15ml)	Stacking gel (4ml)
H2O	6.9 ml	5.9 ml	2.7
%30 acryl-bisacrylamide mix	4.0 ml	5.0 ml	0.67
1.5M Tris(pH 8.8)	3.8 ml	3.8 ml	0.5 (pH 6.8)
%10 SDS	0.15 ml	0.15 ml	0.04
%10 amuniumpersulfate	0.15 ml	0.15 ml	0.04
TEMED	0.009 ml	0.006 ml	0.006

All gels were run with the voltage of 110 (V), then prepared for coomassie blue staining. Gels then were transferred on PVDF (MILLIOPORE) membrane for immunoblotting.

#### 2.11.3. Immunoblotting

After overnight transferring, the membrane were stained with PonceauRed solution for 10 min. after washing with water, all appeared bands were marked and membranes were washed with PBST (%0.1 Tween) three times. The membranes were blocked with %5 NDS/PBS then exposed to the first antibody (anti-Smoc2-pAb IgG/Goat (1:1000) into %2 NDS/PBS and kept in 4°C overnight. Washed again with PBST 3×10min and exposed to the secondary antibody in %2 NDS/PBS: Peroxidase-conjugated Mouse anti-goat IgG (1:2000) for an hour and then washed with PBST 3×10 min (last time just with PBS).

#### 2.11.4. Chemiluminescence assay



To apply for chemiluminescence, all membrane were exposed to chemiluminescence substrate (Super Signal® West Pico) (Thermo SCIENTIFIC) for 15 min in a dark condition and analysed by an appropriate machine (FUJIFIM LAS-3000).

### 2.11.5. Stripping blots for reprobing

To strip and reprobe the membrane in order to detect His-tag on the protein bands, the membranes were washed three times with PBST. Then they were treated with 10ml of stripping buffer and incubated in 55°C, then washed 3×10 min with PBST and blocked with %5 NDS/PBS for overnight.

For probing, we used His-tag probe (HisProbe™-HRP) (Thermo SCIENTIFIC) (1:5000) for overnight exposing to the membranes. Then, membranes were washed three times with PBST and again preparing for chemiluminescence analysing.

### 2.12. FACS analysis

To understand precise number of cells which were expressing the recombinant proteins, FACS analysis was performed for PVC/MI/His-mCherry-Smoc2 and PVC/MI/His-mCherry-Postn. The cells were detected in channel 2 (488nm laser with a wave length of 585) (Accuri C6).

After PVC/MI cells were transfected with pcDNA/His-mCherry-Smoc2 and Postn, cells were prepared for FACS analysis. Two different Transfected cells in 6-well plate were trypsinased and each dissolved in 5ml DMEM. Then 200ul of each was washed in 5% BSA/PBS and centrifuged 5 min in 1000rpm. Then the pellet of each two types was dissolved in 500ul of FACS buffer (5% BSA/PBS).

As FACS analysis was conducted twice, for second time PVC/MI/pcDNA/His-mCherry-Smoc2 and PVC/MI/pcDNA/His-mCherry-Postn were analysed, but in this case 80% of cells were used for FACS analysis.

## 3. Results

### 3.1. Detection of distribution of Smoc2 and Periostin in tissue

Immunofluorescence staining of mouse muscle tissue (Pdgfrb-Cre: Rosa26-LacZ) was conducted in order to detect Periostin and Smoc2 proteins in the tissue. Expression of such proteins was recognised by using first polyclonal antibodies against interested proteins and fluorescent antibodies against the first antibodies. To detect the distribution of Smoc2 and Periostin, antibodies were used to detect Smoc2 and Periostin proteins and alsoNG2 as a marker for pericytes (Fig. 2). To identify the ECM proteins in the basement membrane, an antibody against Nidogen-1 was used. Although the detected Periostin proteins was rather weak (C), Smoc2 proteins were clearly detected in small capillaries (B) and big capillaries (A). To define more clearly, tissue was stained with NG2 antibody, indicating blood vessels and also Nidogen-1 antibody to recognise basement membrane around muscle fibres, as well as blood vessels. The yellow colours imply that the expression of Smoc2 and Periostin proteins by pericytes while they are located on basement membrane.

### 3.2. Plasmid transformation and restriction mapping

#### 3.2.1. Expression plasmids

Plasmids were constructed by using the expression vector ( pcDNA3). Both plasmids contain an expression cassette under the control of CMV promoter. The N-terminal sequence contains signal peptide of BM-40, used previously recombinant expression of ECM proteins (Nischt et al., 1991). The signal peptide sequence is fused to an RGS-His 6 tag to facilitate purification. After a short linker (13 aa) mCherry coding sequence (708 aa) is included. A flexible linker domain (26 aa). The coding sequence of the secreted part of mSmoc2 was fused to the domain. As a result, protein which is expressed would be His-mCherry-Smoc2. For Periostin, the construction is the same. Both plasmids the signal peptide region of Smoc2 and Periostin are not included and secretion is facilitated by the signal peptide of BM-40 (51 aa).

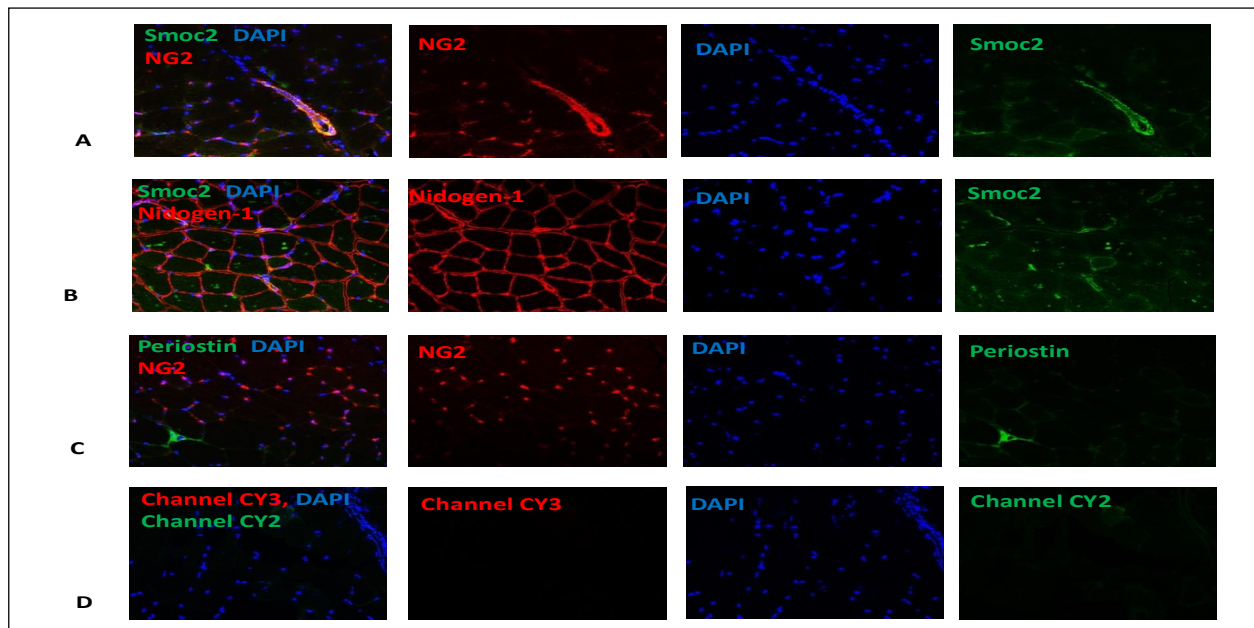
#### 3.2.2. DNA preparation and restriction map

Constructed plasmids were transformed to DH5α bacteria and DNAs were isolated from bacteria (QIAGEN). Final concentration of DNA after isolation was about 856ng/ul and 590ng/ul for pcDNA/His-mCherry-Postnand pcDNA/His-mCherry-Smoc2, respectively.

Restriction mapping was performed in order to verify whether acquired DNAs were constructed properly. Figures 3and 4 show the fragments of bands after digestion with restriction enzymes on 1% agarose gel. In addition, tables 3 and 4 present the expected and detected DNA fragments. Taken together, all fragments were detected as they were expectedwith an exception which is about digestion of plasmid with *Nhe I* in plasmid containing Periostin gene (due to contamination of restriction enzyme).

### 3.3. Recombinant expression of Smoc2 and Periostin proteins

To study whether eukaryotic cells can express the recombinant proteins and also to purify the recombinant proteins, different cell lines were used such as PVC/MI (pericyte-like cell Anxa5<sup>lacZ/LacZ</sup>, knockout), PVC/MII (pericyte-like cells Anax5<sup>+LacZ</sup>, heterozygote) to investigate about angiogenesis and HEK-293 (Human embryonic kidney cells) for recombinant expression of proteins.



**Figure 2. Immunofluorescence staining of muscle tissue (Pdgfrb-Cre: Rosa26-LacZ).** A shows detected proteins Smoc2 (Green) and NG2 (Red), as well as nuclei of cells (Blue). Yellow colours particularly on the capillary of the tissue indicate that the expression of Smoc2 and NG2 proteins are originated from the same cells (Percytes). That pattern is exactly similar with C which displays the expression of Periostin proteins (Green), nuclei (Blue) and NG2 (Red). B, expression of Smoc2 proteins (Green) and Nidogen-1 (a marker of basement membrane) (Red) are indicated which illustrates the basement membrane around muscle fibre and blood vessels. D shows the control of the experiment, so that the cells just were treated with secondary antibodies. **Magnification is 20X.** Microscope: ApoTome ZEISS.

**Table 3. Numbers and molecular weight of pcDNA/His-mCherry-mPostn-1 fragments after electrophoresis.**

As there is just one site for some restriction enzymes (*Xba I*, *Nhe I* and *EcoRV*) a linear DNA is appeared on the gel, while for other enzymes depending of the number of sites to react, different fragments are appeared on the gel.

Restriction Enzyme(s)	Expected Fragment(s) length (bp)	Detected Fragment(s) length (kDa)
Uncut	Sc/oc	—
<i>Hind III</i>	6794, 1652	≈ 6.7, 1.6
<i>Nco I</i>	3345, 2297, 874, 863, 735, 332	≈ 3.3, 2.2, 0.8, 0.7, 0.3
<i>Pst I</i>	4867, 2064, 1515, 358	≈ 4.8, 2.0, 1.4, 0.3
<i>Sma I</i>	Linear	≈ 8.0
<i>EcoRV</i>	Linear	≈ 8.0
<i>Sma I</i> + <i>Pst I</i>	4749, 3697, 3339, 1824, 240	≈ 4.7, 3.6, 3.2, 1.7, 0.2
<i>Sma I</i> + <i>Nco I</i>	4482, 3619, 2745, 2413, 116	≈ 4.4, 3.5, 2.7, 2.4, 0.1
<i>Sma I</i> + <i>EcoRV</i>	5115, 3331	≈ 5.0, 3.3
<i>Nhe I</i>	Linear	—
<i>Xba I</i>	Linear	≈ 8.0, 5.0

### 3.3.1. Transfection of plasmids to HEK-293 cells

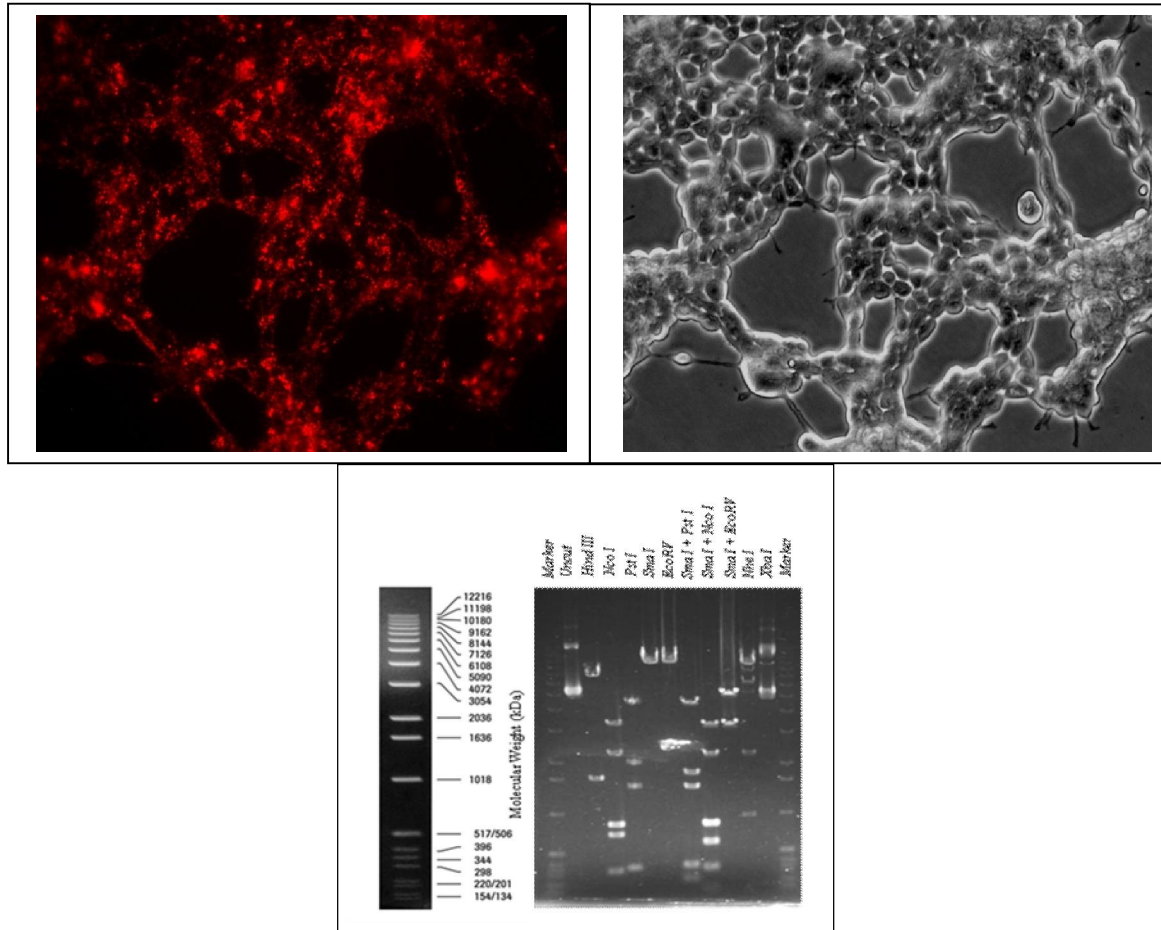
Cells were transfected with jetPRIME® approach. As figure 5 displays, most of the cells express the pcDNA/His-mCherry-Smoc2 proteins. In order to select transfected cells, they were treated with 250 and 400 µg/ml of G418.

### 3.3.2. Transfection of plasmids to pericyte-like cells (PVC/MI and PVC/MII)

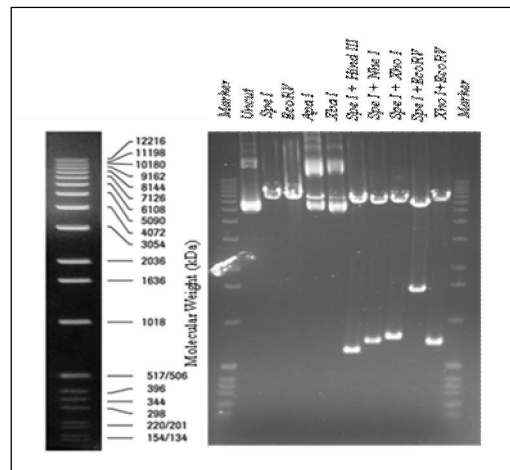
#### 3.3.2.1. Transfection of plasmids to PVC/MII cells

Cells were transfected with jetPRIME® approach. Similar to HEK-293 cells, PVC/MII did not express any pcDNA/His-mCherry-Postn proteins. Also, just one cell was infected with the pcDNA/His-mCherry-Smoc2 and expresses the recombinant protein. Vesicles inside the cells which are prepared to be secreted outside are obviously

shown (Fig. 6). Other methods for transfection of PVC/MII were employed such as Lipofectamine™ Reagent, Fugene® 6 Transfection Reagent. However, the cells were not infected with mentioned methods (Table 5).



**Figure 3. DNA electrophoresis of pcDNA/His-mCherry-mPostn-1.** Different fragments of DNA are appeared on the gel due to function of restriction enzymes. All fragments display the molecular weights as it was expected. As the result of contamination of *NheI* enzyme with other enzymes, more than on fragment is appeared on the gel. The marker (1 kb Marker X Roche) determines the molecular weight of each fragment.

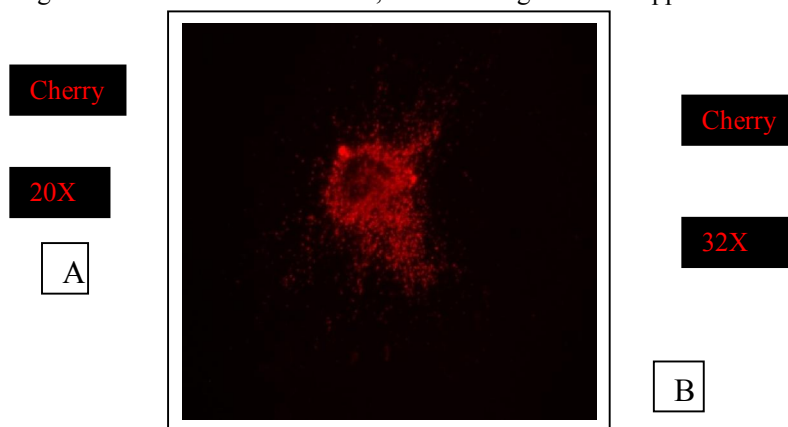


**Figure 4. DNA electrophoresis of pcDNA/His-mCherry-mSmoc2.** Different fragments of DNA are appeared on the gel due to function of restriction enzymes. All fragments show the molecular weights as it was expected. The marker (1 kb Marker X (11498037001) Roche) on the left side determines the molecular weight of each fragment.

**Table 4. Numbers and molecular weight of pcDNA/His-mCherry-mSmoc2 fragments after electrophoresis.** As there is just one site for some restriction enzymes (*Xba I*, *Nhe I* and *EcoRV*) a linear DNA is appeared on the gel,

Restriction Enzyme(s)	Expected Fragment(s) length (bp)	Detected Fragment(s) length (kDa)
Uncut	Sc/oc	-
<i>Spe I</i>	Linear	≈ 8.1
<i>EcoRV</i>	Linear	≈ 8.1
<i>Apa I</i>	Linear	≈ 7.0
<i>Xba I</i>	Linear	≈ 7.0
<i>Spe I</i> + <i>Hind III</i>	6882, 640	≈ 8.1, 0.6
<i>Spe I</i> + <i>Nhe I</i>	6777, 745	≈ 8.0, 0.7
<i>Spe I</i> + <i>Xho I</i>	6738, 748	≈ 8.0, 0.7
<i>Spe I</i> + <i>EcoRV</i>	6010, 1512	≈ 6.0, 1.5
<i>Xho I</i> + <i>EcoRv</i>	6794, 728	≈ 8.1, 0.7

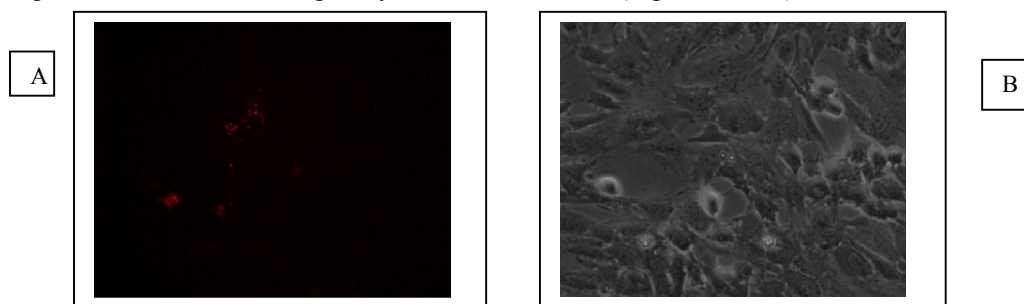
while for other enzymes depending of the number of sites to react, different fragments are appeared on the gel.



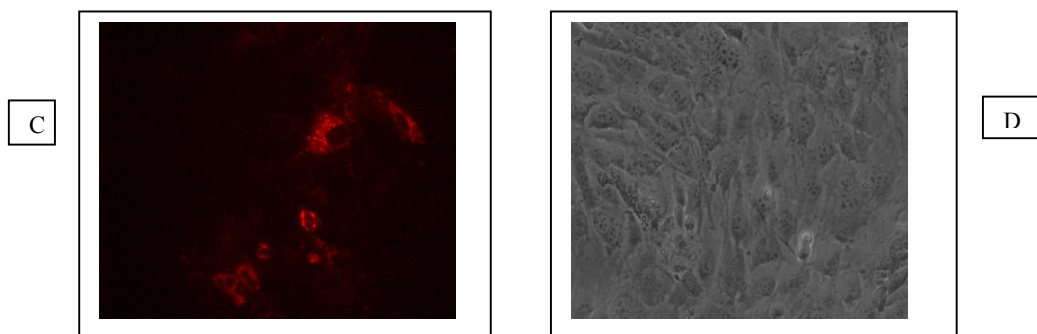
**Figure 5. Expression of recombinant proteins in HEK-293 cells.** A: illustrates fluorescence light of channel 2 fluorescent implying expression of cherry proteins. B: shows the phase contrast picture of transfected HEK-293 cell. (Microscope: Axiovert 40 CFL ZEISS).

### 3.3.2.2. Transfection of plasmids to PVC/MI cells

To transfect the plasmids to PVC/MI, two methods were performed: transfecting by calcium phosphate approach and jetPRIME® approach. In transfection of PVC /MI with calcium-phosphate method no transfected cells were found. Whereas, in transfection of cells by jetPRIME® approach just 1% of cells expressed the pcDNA/His-mCherry-Postn proteins and 10 % expressed the pcDNA/His-mCherry-Smoc2 proteins (Fig. 7). Cells were treated with 400ug/ml of G418 to select just transfected cells. In the transfected experiments only few cells were expressing the recombinant proteins. Therefore, we used Flow cytometry for detecting expressing cells in large pool of cells. Recombinant proteins were detected by their Cherry domains which can be detected in channel 2 of a cytometer (Accuri C6). Part of signals can be detected in FL2 channel. Additionally, FSC and SSC were detected, characterising the size and granularity of cells, respectively. Surprisingly, after two weeks transfection, no specific expressing cell was detected, although they were G418 resistant (Fig. 8 A and B).



**Figure 6. Transfected PVC/MII cells by jetPRIME® approach.** The picture illustrates one PVC/MII cell which expresses the recombinant proteins. Microscope: Axiovert 40 CFL ZEISS.



**Figure 7. Transfecting PVC/MI cells by jetPRIME® method.** A: represents PVC/MI cells expressing the recombinant proteins. B: illustrates the phase contrast photo of the cells presented in previous picture. C: displays expression of recombinant proteins by PVC/MI cells. Vesicles inside the cells show how proteins are prepared to be secreted to the extracellular environment. D: illustrates the phase contrast photo of the cells presented in picture C.

**Table 5. Effectivity of different transfection methods for three types of cells.** (++) indicates the most effective approach for on specific cell line, (- +) represents partially effective, (0) indicates no effective at all. (NT) represents not tested.

Transfection methods	HEK-293 cells	PVC/MII cells	PVC/MI cells
Lipofectamine™ Reagent	NT	0	NT
Fugene®6 Transfection Reagent	0	- +	NT
Calcium-phosphate	NT	NT	0
jetPRIME®	++	- -	- +

### 3.4. Purification of recombinant proteins

In order to detect recombinant proteins by immunoblotting and also understand the function of proteins, purification of recombinant proteins was carried out according to Clontech (TALON Affinity chromatography). For this purpose, HEK-293 cells were regularly kept in serum-free DMEM (plus 400ug/ml G418) and also 10% FCS/DMEM, in order to collect the conditioned media.

The principal of purification is that, recombinant proteins bind to the resin which consist of a tetradentate chelator charged with cobalt which confer a high affinity for His-tagged (recombinant protein) proteins (Chaga et al., 1994). Recombinant proteins then are eluted with a buffer which is composed of Na phosphate, NaCl and imidazol to break the bonds. In our case, all eluted proteins were usually collected in 15 fractions (1 ml each).

### 3.5. Detection of proteins by immunoblotting

After protein purification of collected media, eluted proteins were precipitated and run on the either 8% or 10% polyacrylamide gel. To detect recombinant proteins on the gels, immunoblotting was carried out after transferring gels on the PVDF membranes.

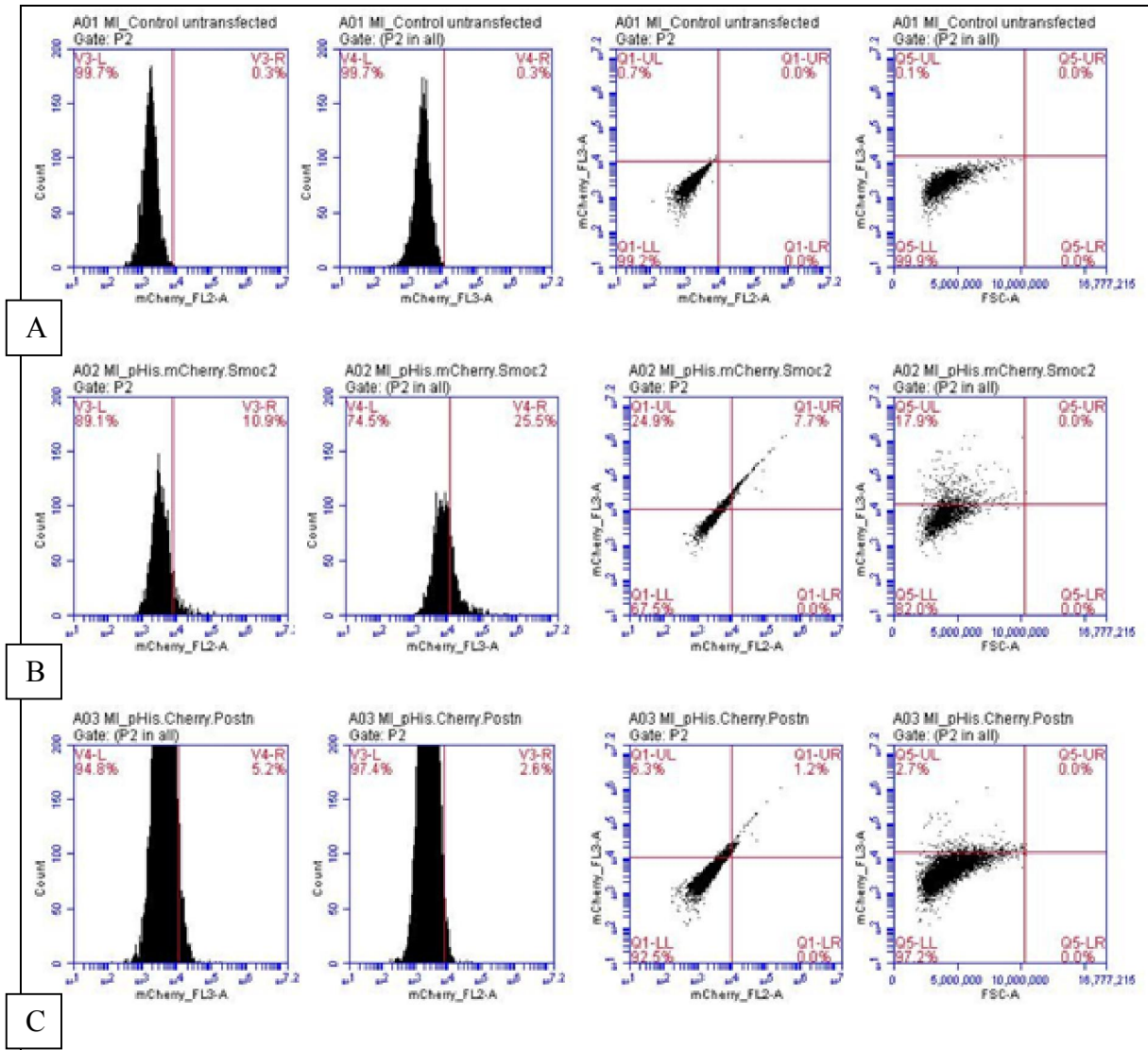
#### 3.5.4. Immunoblotting of serum-free and serum-containing media (purified and supernatant media).

In order to make sure whether all recombinant proteins are still in collected media and also in eluted protein fraction, immunoblotting of all was carried out. The procedure was that to precipitate 0.5 ml of any the most possible eluted protein fractions from serum-containing and serum-free media of HEK293/His-Cherry-Smoc2, as well as the conditioned media of HEK293/His-Cherry-Smoc2 (collected on 09/May/2012, 10/May/2012 and 11/May/2012). All precipitated proteins were electrophoresed on 8% polyacrylamide gel in two different conditions: reduced and non-reduced conditions. They then transferred on the PVDF membranes and exposed to the Smoc2 antibody and were prepared for chemiluminescence immunoassay. Photos illustrated the bands with various molecular weights (Fig. 9 A and B). However, we could identify the bands representing His-Cherry-Smoc2 and also degraded His-Cherry-Smoc2 proteins. The membranes again were prepared to be exposed to His-tag probes and doing chemiluminescence immunoassay. Overlapped bands may confirm more the presence of the interested protein (Fig.9 A and B).

### 3.6. 3D monoculture of HUVECs treated with Serum-free medium HEK-293/His-mCherry-Smoc2

In order to investigate the functions of Smoc2 proteins in angiogenesis, a monoculture of HUVECs in 3D culture was prepared in 6 wells of a 24-well plate in order to treat with the eluted proteins from fractions with containing the most amounts of recombinant proteins, which were already identified by doing polyacrylamide gel electrophoresis, and also collected serum-free 293/His-Cherry-Smoc2. After changing the medium of the culture every day replacing

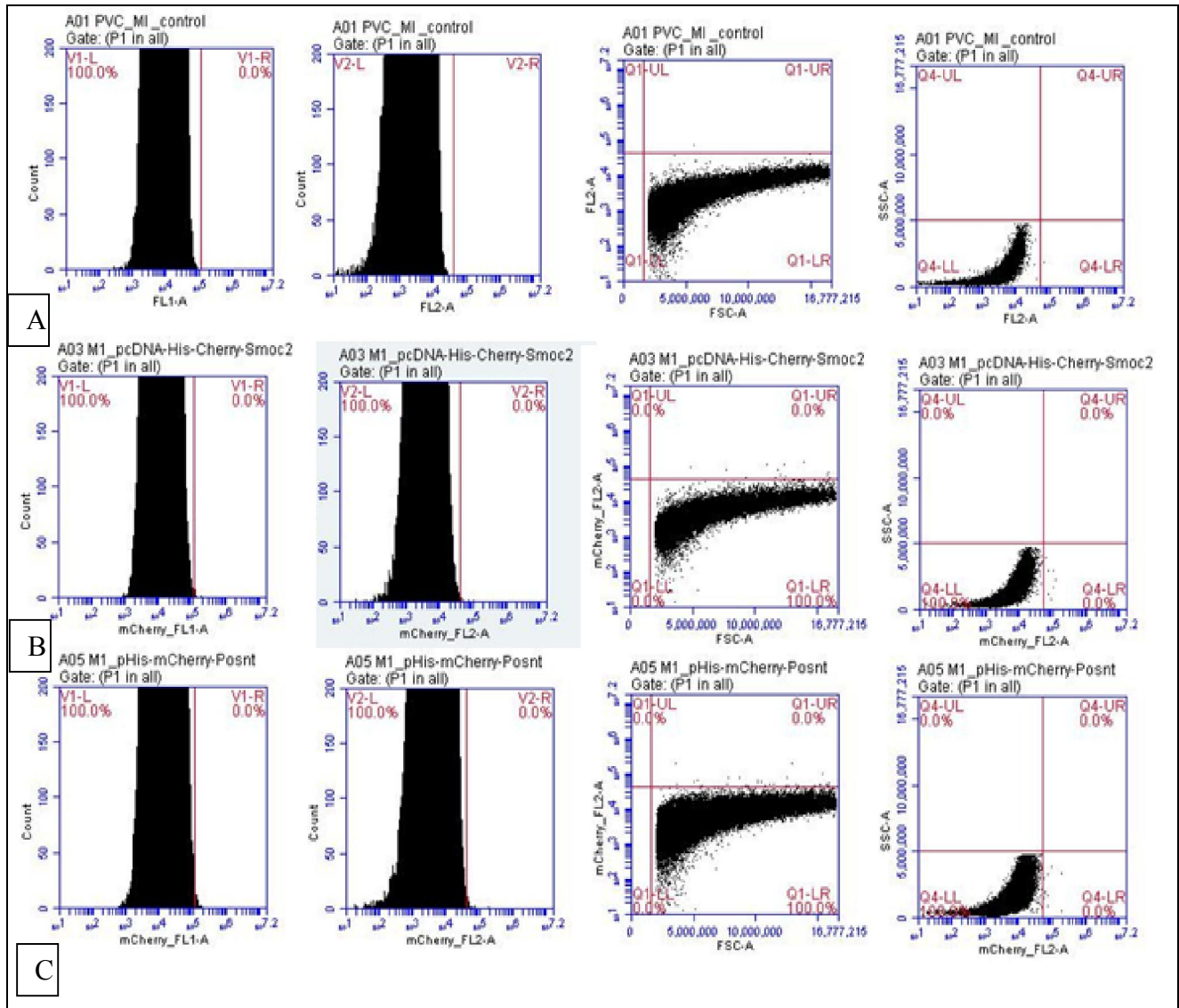
with collected media and serum-free/ 5X growth factors in ratio of 1:4 for a period of one week and after formation of tubes by HUVECs, they were immunostained and visualised by fluorescence microscope. Nucleus and membranes of HUVECs were immunostained nicely by DAPI and CD31 antibodies, respectively (Fig. 10). Overlapping of green areas (CD31) and blue areas (nucleus) confirm the status of HUVECs in the culture. However, as we expected to observe the presence and involvement of Smoc2proteins (tagged with Cherry proteins) we could not detect any fluorescent light representing the existence of such proteins (Fig. 10).



**Figure 8 A.** FACS analysis of PVC/MI/His-mCherry-Smoc2 and PVC/MI/His-mCherry-Postn after two days transfection. **A:** indicates the control of experiments which untransfected PVC/MI cells were analysed. **B:** shows the expression of recombinant proteins (His-mCherry-Smoc2) by PVC/MI cells. As it is shown, about 7.7% of cells (shown in Q1-UR) were expressing the recombinant proteins. **C:** illustrate the percentage of cells expressing recombinant proteins (His-mCherry-Smoc2) which is about 1.2% (shown in Q1-UR).

#### 4. Discussion

Due to the fact that matricellular proteins modify the features of ECM and also reactivity of cells, it was speculated that such proteins may also play important roles during angiogenesis. Smoc2 and Periostin as two members of matricellular proteins may interact with vascular cells and influence angiogenesis due to their interactions with ECM proteins such as integrins (Kuhn et al., 2007; Liu et al., 2008; Morra and Moch, 2011; Rocnik et al., 2006). With this regard, detection, expression, purification and initial tests for biological functions were conducted.



**Figure 8 B. FACS analysis of PVC/MI/His-mCherry-Smoc2 and PVC/MI/His-mCherry-Postn.** A: presents the control of experiment which untransfected PVC/MI cell were analysed. B and C show no expression of recombinant proteins neither Smoc2 nor Periostin was detected, respectively.

#### 4.1. Expression of matricellular proteins in HEK-293 cells

Expression of recombinant proteins in HEK-293 cells after being transfected with pcDNA/His-mCherry-Smoc indicates that the constructed plasmids are able to be transfected and express recombinant Smoc2 in cells. As result of HEK-293 cell showed, most of the cells expressed the recombinant proteins, and the expression of proteins was detected through the observation of the fluorescent Cherry proteins tag by fluorescence microscopy. However, in transfection of HEK-293 with pcDNA/His-mCherry-Postn, we did not see any expression of such proteins. Yet, there is not any clear reason for this finding. As transfection is very effective in HEK-293 and the structure and sequence of the construct was verified, we would like to speculate that either the Postn protein is not stable in these cells or causes death in expressing cells. This has to be tested in future experiments.

#### 4.2. Expression of matricellular proteins in pericyte-like cells

Different methods of transfection were applied for pericyte-like cells. PVC/MI and PVC/MII cells, the results of transfection indicate that these cells are rather resistant to transfection. PVC/MI cells were transfected in a very low number as data of FACS analysis showed. Although expressing PVC/MI/His-mCherry-Smoc2 and PVC/MI/His-mCherry-Postn transfected could be found, the expression of recombinant proteins was gradually decreased, so that after two weeks no cells secreting recombinant proteins could be detected by FACS analysis (as

detected by mCherry fusion tag). As the transfected cells were selected by adding G418 to the medium, it shows that transfection was done successfully. One potential reason for that could be that, cells died after they overexpressed the recombinant proteins and washed away as cells were regularly kept in fresh medium. Another possibility could be due to partially integration of plasmids to the eukaryotic chromosome. In other words, part of the plasmids was integrated into the eukaryotic genome which contains just the gene which expresses the resistance to G418 and the rest did not integrated to DNA. It also may be speculated that the transfected cells lost their adhesive ability to the cell culture plates and they were washed away during changing the medium of cells, such an idea would imply that the overexpression of matricellular proteins may affect survival (due to overexpression) or adhesion properties (due to modification of ECM). This has to be analysed in more details by additional experiments and may give important clues to function of this group of protein.

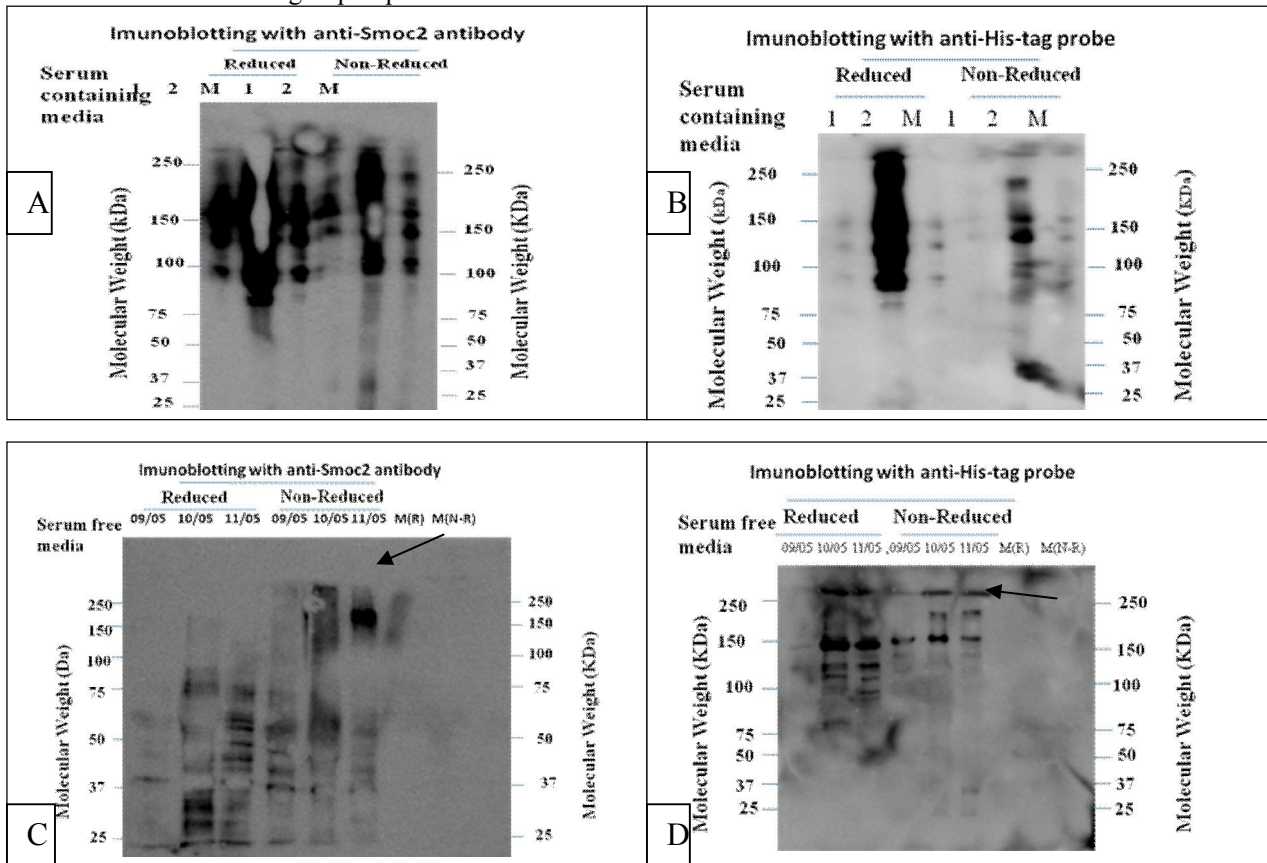
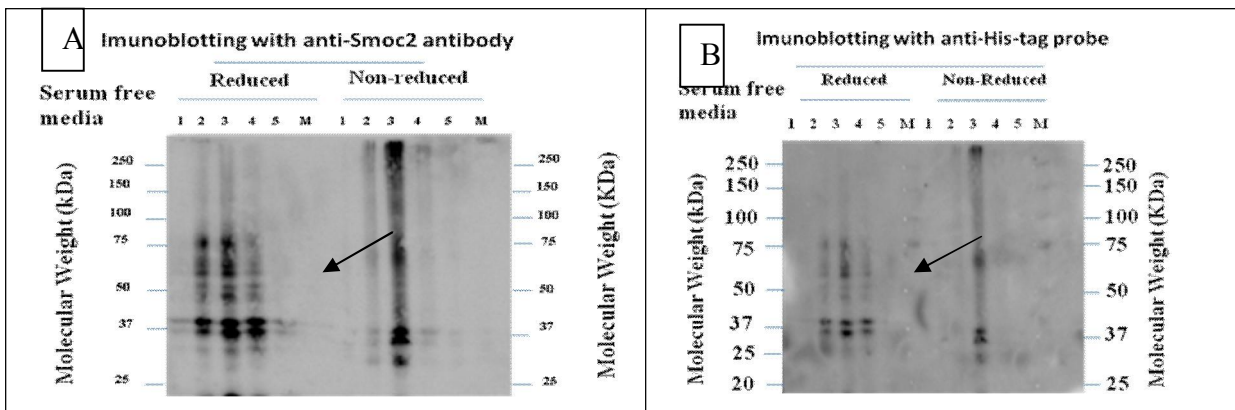
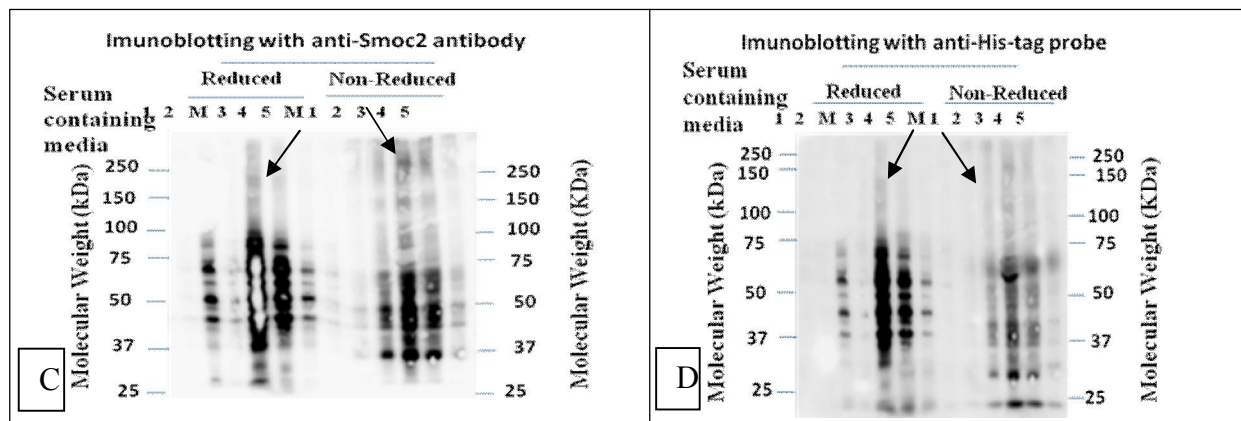


Figure 9A. Western blot and Chemiluminescence immunoassay for serum-free and serum-containing media with anti-Smoc2 antibody and anti-His-tag probe. A and B display the immunoblotting of serum containing media which were exposed to anti-Smoc2 and anti-His-tag probe respectively. C and D represent the same experiments but for serum-free media. Some overlapped bands are arrowed. M: Marker.







**Figure 9 B.** Western blot and Chemiluminescence immunoassay for serum-free and serum-containing media with anti-Smoc2 antibody and anti-His-tag probe. **A and B** display the immunoblotting of serum-free media which were exposed to anti-Smoc2 and anti-His-tag probe respectively. **C and D** represent the same experiments but for serum-containing media. Some overlapped bands are arrowed. M: Marker.

#### 4.3. Morphological change in transfected pericyte-like cells (PVC)

Although the rate of transfection in both types of cells was very low, both types of PVC cells showed morphological changes after transfection. A few transfected PVC/MII with pcDNA His-mCherry-Smoc2 by FuGENE® 6 Transfection Reagent showed some changes in their shape and size, while it was not seen in control cells of experiment. As the transfected cells had irregular shape and showed sign of formation of vesicles and fragmentation. It may be thought that such cells were undergoing to apoptosis. However, experiments to detect cell death like staining with Annexin V probes and Propidium iodid for dying and dead cell, respectively, should be performed to support that idea.

In PVC/MI after transfection to pcDNA/His-mCherry-Postn also morphological changes was observed. In this case expressing cells seem to differentiate to adipocyte cells (due to the presence of lipid vesicles inside the cytoplasmic). However, no experiment was carried out to confirm the speculation. Staining for lipid deposition or the detecting the expression of adipocyte-specific marker genes (PPAR gamma mRNA by RT-PCR) would be useful.

#### 4.4. Purification of secreted Smoc2 proteins

Purification of proteins from serum-free and serum-containing media HEK-293/His-mCherry-Smoc2 was carried out. Purified proteins were analysed by polyacrylamide gels and revealed that in both serum-containing and serum-free media recombinant proteins can be detected through staining with coomassie blue and by Smoc2-specific immunoblotting. The results indicate that proteins with an expected molecular weight ( $\approx 76$  kDa) can be detected. Therefore, the secreted monomeric protein shows the expected molecular weight and indicates that Smoc2 protein can be successfully expressed. In addition, doing immunoblot under reduced and non-reduced condition suggests that the reducing agents (eg.DTT) break numerous S-S bridges of proteins (Geiger and Arnon, 1976). The Smoc2 protein has 24 cysteine amino acids and may therefore form up to 12 Cys-Cys bridges. Breaking the Cys-Cys bridges may have noticeable differences in movement of protein through the gel, resulting in appearing in different molecular weights. The appearance of higher molecular weight bands in the range of 200 to 250 kDa indicates the formation of higher molecular weight multimers. The size may indicate the formation of trimers, but this has to be defined by additional studies. Other protein bands with lower molecular weights may represent degraded recombinant proteins, respectively.

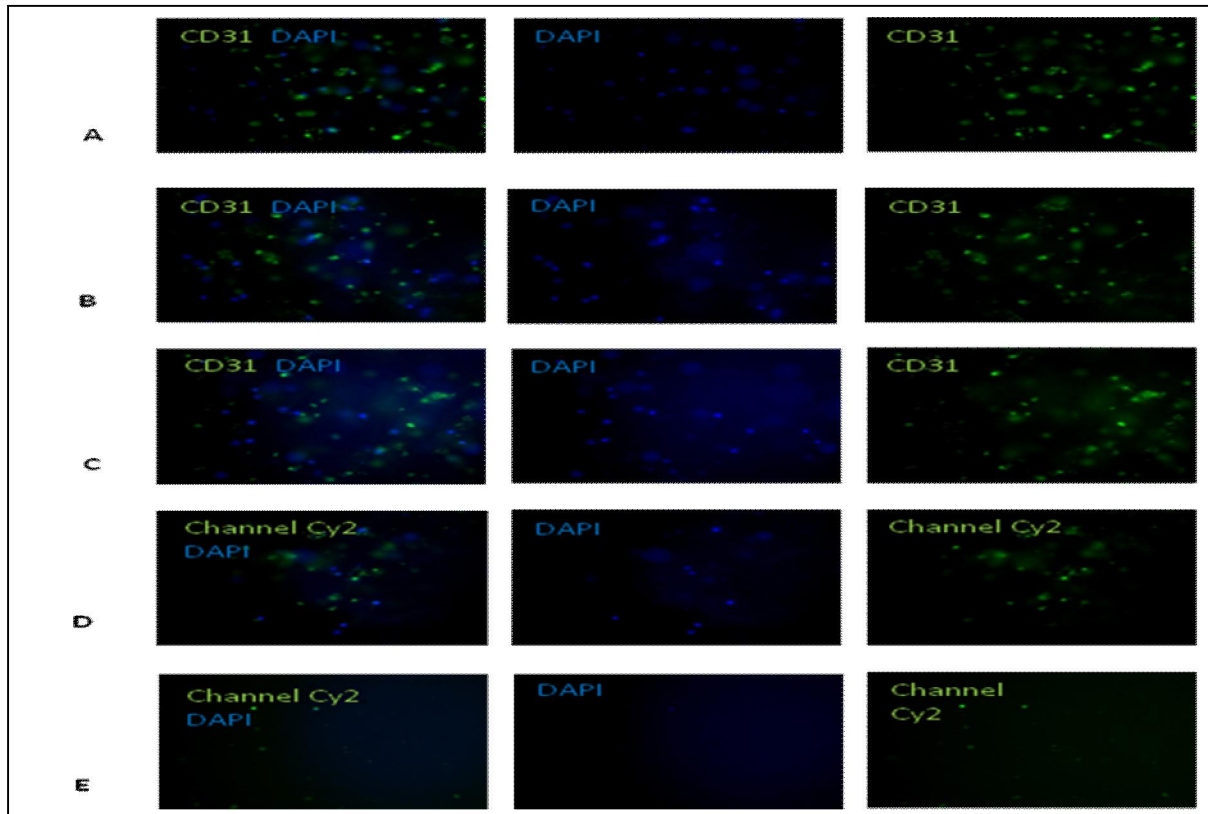
#### 4.6. Effects of matricellular proteins on angiogenic differentiation

It was stated previously that ECM proteins modify and change the features of ECM. Otherwise, previous studies indicated that Smoc2 and Periostin are both significantly up-regulated during angiogenic differentiation in vitro. Therefore, the effects were tested on tube formation of endothelial cells in 3D culture. No significant effect on tube formation and survival of endothelial cells was seen. This could be due to the same effects as discussed before. Therefore, more studies are needed to define any effects of these proteins.

#### 4.7. Summary, outlook and future investigations

The results show that Smoc2 and Periostin proteins can be expressed and purified from HEK-293 cells. Otherwise, pericyte-like cells PVC/MI and PVC/MII cells could be transfected only with very low efficiency and no stably expressing clones could be selected. Initial functional assays with purified proteins were performed, but did

not reveal yet significant result. Therefore, future studies should focus on the following strategies: improvement of transfection protocols, optimisation of the protein purification protocols, optimisation of selection of stably expressing cells, reduction of degradation of proteins, use of improved functional assays. The project was started as yet there is only little information available. For further investigations, transfection of pericyte-like cells with optimised methods would be an approach to transfect the cells to express the proteins. As immunoblotting of serum-free and serum-containing media showed, protein bands with higher molecular weight as expected could be studied to indicate whether they are multimeric recombinant proteins. Alternatively, they are recombinant proteins may be bound to other proteins. Due to time limitation, only primarily experiments could be performed in order to address morphological changes of transfected cell, as well as investigation on differentiation of transfected PVC/MI. Therefore, further studies should include: expression and purification of more recombinant proteins for in vitro studies, improvement of transfection methods for PVC cells (option would be viral transfection systems), and functional studies involving adhesion, migration and antigenic differentiation in 2D or 3D cultures.



**Figure 10. Immunofluorescence staining of the 3D culture.** A and B show the staining of HUVECs which were treated with collected serum-free HEK-293/His-Cherry-Smoc2 (collected on 09/May/2012) and 5X growth factors in ratio of 1:4. Although the nuclei and CD31 (marker of endothelial cells) were observed, but Cherry proteins were not detected. Such pattern is also similar for C and D which cells treated with the same amount of media but the date of collection of medium was different, 10/May and 11/May, respectively. Finally E indicates the control of experiment, so that HUVECs were treated just with serum-free medium and 5X growth factors in ratio of 1:4.

**Magnification is 10X. Microscope:** Axiovert 40 CFL ZEISS.

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#### List of abbreviations

aa: Amino acid  
 Amp: Ampicillin  
 Ab: Antibody  
 BSA: Bovine serum albumin  
 CMV: Cytomegalovirus  
 DMEM: Dulbecco's Modified Eagle Medium  
 DMSO: Dimethyl sulfoxide

**DTT:** Dithiothreitol  
**ECM:** Extracellular matrix  
**FACS:** Fluorescence activated cell sorting  
**FCS:** Fetal calf serum  
**FGF:** Fibroblast growth factors  
**HEK-293 cells:** Human embryonic kidney-293 cells  
**HUVEC:** Human umbilical vein endothelial cell  
**LB:** Lysogeny broth  
**mAb:** Monoclonal antibody  
**pAb:** Polyclonal antibody  
**MMP:** Matrix metalloproteinase  
**NDS:** Normal donkey serum  
**PBS:** Phosphate buffered saline  
**PBST:** Phosphate Buffered Saline Tween -20  
**PDGF:** Platelet-derived growth factor  
**Pdgfrb:** Platelet-derived growth factor receptor  
**PFA:** Paraformaldehyde  
**PVC/MI:** Pericyte-like cells (anxa5<sup>lacZ/lacZ</sup> mouseknockout)  
**PVC/MII:** Pericyte-like cells (anxa5<sup>+lacZ</sup> mouseheterozygote)  
**PVDF:** Polyvinylidene fluoride  
**Postn:** Periostin  
**rpm:** Rounds per minute  
**SDS-PAGE:** Sodium dodecyl sulfatepolyacrylamidegel electrophoresis  
**Smoc2:** SPARC-related modular calcium-binding protein 2  
**SPARC:** Secreted protein acidic and rich in cysteine  
**TBS:** Tris-buffered saline  
**TCA:** Trichloroacetic Acid  
**TGF:** Transforming growth factor  
**VEGF:** Vascular endothelial growth factor  
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