CONTENTS

A multidisciplinary program using World Health Organization observation forms to measure the improvement in hand hygiene compliance in burn unit

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Abstract: Nosocomial infections occur frequently in patients with burn injuries and are a major cause of morbidity and death. Hand hygiene (HH) was found to be a fundamental part of preventing health care–associated infections. Improving HH compliance is a major target for the World Health Organization (WHO) Patient Safety Challenge. Multimodal approaches including educational programs and the introduction of alcohol based hand-rub in healthcare settings proved to be the most effective strategies for promoting HH compliance. **Aim of the work** was to assess the improvement of hand hygiene compliance of HCWs (doctors, nurses and workers) in burn unit over a period of 12 months through a multi-faceted training program providing knowledge on compliance with HH by using WHO HH observation forms. **Materials and methods;** A direct observational before–after study to assess the improvement of HH compliance , through a multi-faceted training program, was implemented at the burn unit in a tertiary referral teaching hospital in Cairo. The unit consists of a ward with the capacity of 12 beds, an ICU with the capacity of 5 beds, emergency room with the capacity of 1 bed, and 1 operation theatre. It was carried out during the period from October 2008 till September 2009.The improvement intervention included lectures , on job training , distributing factsheets and reminders and providing HH supplies as alcohol hand rub dispensers. **Results;** There was a significant increase in average HH compliance percentage from 39.8% during the baseline phase to 61.9% during the improvement phase. This increment was sustained during the control phase (HH compliance percentage 60.6%). HH compliance percentage among different professional categories showed highest compliance among nurses throughout the three phases of the study. The nurses' category also demonstrated the highest percentage as regards WHO 5 moment of HH orientation and performing right HH technique. **Conclusion;** The multi-faceted training program, through different approaches, was successful to improve HH compliance among HCWs at the burn unit. **Recommendations ;** Continuous improvement efforts as regular training and persistent evaluation , monitoring and feedback are crucial to maintain and even enhance adherence to appropriate HH practice.

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Key words: Nosocomial infections**;** Hand hygiene**;** Compliance**;** Improvement**;** World Health Organization (WHO)**.**

1. Introduction

Hand hygiene (HH) is a fundamental part of preventing health care–associated infections (HAI), which cause mortality and morbidity, prolong hospital stays, and contribute to increases in health care costs. Improving HH compliance is a major target for the World Health Organization (WHO) Patient Safety Challenge (WHO, 2006).

Improvements in HH compliance have been associated with lower rates of acquisition of multidrug-resistant organisms, including methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococcus (VRE) within the hospital (McBryde et al., 2006).

Nosocomial infections occur frequently in patients with burn injuries and are a major cause of morbidity and death. The burn wound is especially susceptible to microbial invasion because of loss of the protective integument and the presence of devitalized tissue (Andrew et al., 2002).

Reduction of the risk of infection is of utmost priority in caring for the burn patients. Prevention of cross contamination between patients and personnel is an important objective of the infection control program in the burn unit. Strict hand hygiene shall be practiced before and after each patient contact with an appropriate antiseptic hand washing agent or an alcohol hand rub. HH shall be performed immediately prior to donning or after doffing gloves and after contact with any contaminated surface (UTMB, 2008).

HH was found to be the single most important factor in the prevention of HAI. The 3 most frequently reported methods of measuring HH compliance were: (1) direct observation, (2) self-reporting by health care workers (HCWs), and (3)

indirect calculation based on HH product usage (McGuckin et al., 2009).

Attention to various behavioral factors and formulation of waterless handrubs that allow ease of use with improved compliance have contributed to some improvements in HH compliance, with successful national-, local-, and hospital-level HH campaigns being reported from several countries (Sladek et al.,2008). Prior research has identified the importance of feedback on HH compliance and of making HH campaigns multidisciplinary and multimodal (Stout et al., 2007).

Although healthcare worker compliance with HH guidelines is considered the corner stone of the prevention of pathogen cross-transmission (Rozenthal et al., 2005) , the overall proportion of adherence remains low, usually much less than 50% in most hospitals (Cohen et al., 2003). The most effective approach suggested for promoting HH compliance was by using multidimensional strategies including educational programs and the introduction of alcohol based hand-rub in healthcare settings (Randle et al., 2006). Recent reports have emphasized the effectiveness of using multidisciplinary approaches and the relevance of providing contextualised knowledge for activating practices in different fields of healthcare sciences (Freeman et al., 2008).

Aim: The objective of the study was to assess the improvement of hand hygiene compliance of HCWs (doctors, nurses and workers) in burn unit over a period of 12 months, through a multi-faceted training program providing knowledge on compliance with HH , by using WHO HH observation forms .

2. Materials and Methods

*** Study design:**

- A direct observational before–after study to assess the improvement of HH compliance , through a multi-faceted training program , was implemented at the burn unit in a tertiary referral teaching hospital in Cairo. The unit consists of a ward with the capacity of 12 beds, an ICU with the capacity of 5 beds, emergency room with the capacity of 1 bed, and 1 operation theatre. It was carried out during the period from October 2008 till September 2009.
- Selected program members and their role:
  - Study members: Implementation of different steps of the program (Direct observation, collection of data, training sessions and analysis of results).
  - Head of Department and ICU director: Offered consent and leadership commitment during different steps of the program. They made HH an educational priority and supported the success of HH–related initiatives through participating in educational and training sessions.
  - The hospital infection control nurses: Coordination between study members and unit staff. They arranged the schedual of training sessions according to convenient timing of different staff categories. They were trained by study members to carry out HH observation and to use WHO observation forms to record HH actions and opportunities.
  - Head of nurses in the ICU: Supervised attendance of nursing staff to different educational and training sessions during the project.
  - Maintenance engineer: Offered advice and consultation as regards infrastructure changes required.

*** Mission statement:**

"Assessment and improvement of hand hygiene compliance of HCWs (routine-hygienic - surgical scrub-alcohol rub) in burn unit over a period of 12 months to raise the total hand hygiene compliance (number of actions/number of opportunities) among doctors, nurses and house keepers to 65% through a multi-faceted training program."

*** Team charter:**

- The team met every two weeks for one hour.
- Objective: To increase hand hygiene compliance rate to 65% by staff members at burn unit.
- Benefits: The program is committed to measure and increase hand hygiene compliance rate of different staff members.

*** Study steps:**

The study was accomplished in four consecutive steps (Table 1):

- Step 1: Measure: Defining the study population and assessment of the current status of the unit as regards HH compliance rate, presence of appropriate HH facilities (sinks - soap dispensers - paper towel dispensers) and availability of HH supplies.
- Step 2: Analyze: Analyzing data collected in step 1 to determine weaknesses and strengths and finding causes of in-adherence to HH guidelines through root cause analysis.
- Step 3: Improve: Taking corrective actions to overcome weaknesses and emphasize strengths to achieve the study's objective through an intensified educational and training program.
- Step 4: Control: Maintaining direct observation of HH compliance and sustaining the achievements of the improvement phase through regular meetings, educational sessions and routine feedback.

Table 1 : Time schedule

	October & November 2008	December 2008 & January 2009	February to May 2009	After May 2009
Measure				
Analyze				
Improve				
Control				

***Step I: Measure :**

A. Study setting and population :

1. Detailed layout of the unit

A- Ward consisted of :

- 1 Operation theater with a separate scrub area
- 1 Nurses room with one sink
- 1 Hydrotherapy room with one sink
- 1 Dressing room with one sink
- 3 Patients room 4beds each with no sinks
- 2 Toilets with 2 sinks each

B- ICU consisted of:

- 1 Corridor with one sink
- 5 Separate cubicles with no sinks
- 1 Toilet with 2 sinks

C. Emergency room consisted of:

- 1 Dressing room with one sink
- 1 Operation theater for minor interventions

2. Population

For the audit of practices and survey of knowledge as regard hand hygiene, the population involved was represented in table 2.

Table 2: A list of the health care workers present in the unit and targeted by the study:

Distribution	Doctors	Nurses	Housekeepers
Ward	- Unit manager - 3 residents - 3 assistant lecturers - 1 lecturer - 2 anesthesiologists	4	1
Emergency room	The same members of the ward	3	1
ICU	The same members of the ward	10	1
operation theatre	The same members of the ward	3	1

B. Developing Operational Definitions:

1. Calculation of Hand hygiene compliance% (adherence percentage):

It is defined as the ratio of the number of actions (numerator) that were done correctly to the number of opportunities (denominator) as expressed by the following formula:

$$\textbf{Compliance (\%)} = \frac{\textbf{Hand Hygiene Actions}}{\textbf{Opportunities}} \times 100$$

Where opportunities represent the points in time within the care process when hand hygiene should be performed as specified by the indications. WHO guidelines recommend that five indications be measured which are; before patient contact, before aseptic task, after body fluid exposure risk, after patient contact & after contact with patient surroundings.

While, actions comprise the performance of hand hygiene. Each opportunity should correspond to an action of performing hand hygiene *(WHO, 2006).*

Adherence ratio was calculated using 2 types of calculations

- **Composite measures**

A composite measure is a compilation of multiple indications into a single adherence ratio. This type of measure is calculated by dividing the sum of observed actions (numerator) by the sum of observed opportunities (denominator) (WHO, 2006).

- **Item-by-item measures**

Item-by-item measures allow looking at hand hygiene adherence for opportunities related to certain indication. When calculating this kind of ratio , the denominator is the total number of opportunities for a given indication. The numerator is the total number of hand hygiene actions observed when the opportunity is present as expressed by the following formulas (WHO, 2006).

N.B. Some opportunities may have more than one indication.

# of observed hand hygiene actions before patient contact **× 100**

# of hand hygiene opportunities observed before patient contact

& # of observed hand hygiene actions before aseptic task **×100**

# of hand hygiene opportunities observed before aseptic task & # of observed hand hygiene actions after body fluid exposure risk **× 100**

# of hand hygiene opportunities observed after body fluid exposure risk & # of observed hand hygiene actions after patient contact **× 100**

# of hand hygiene opportunities observed after patient contact

& # of observed hand hygiene actions after contact with patient surroundings **× 100**

# of hand hygiene opportunities observed after contact with patient surroundings

- **The ratio of routine hand washing versus alcohol-based hand rub was also calculated**

2. Evaluation of the staff performance of hand hygiene technique:

The components of hand hygiene technique audit tool were scored from zero to two, depending on whether the technique was neglected, partially performed, or performed. Finally the % of different professional categories performing the right technique were compared. (Individuals scoring < 30/40 were not considered performing right technique.)

N.B: for the evaluation of hand hygiene technique, each person will be observed once during his activity.

3. Evaluation of the hand hygiene knowledge assessment of the health care workers:

For simplicity, we categorized the WHO hand hygiene knowledge test for health care workers into 3 main items to be evaluated, which were: staff received previous training on hand hygiene, they knew the importance of hand hygiene (hand washing versus alcohol hand rub), and they were oriented with the WHO 5 moments of hand hygiene. Then the answers for the questions related to each of the previous items were evaluated and a final % of staff members oriented with each item was calculated.

4. Evaluation of the ward structure as regard hand hygiene facilities and supplies:

The components of hand hygiene facilities audit tool were scored according to the Egyptian ministry of health scoring system from zero to two, depending on whether this component was not present, present not complete, or present and complete. The final evaluation of the whole ward structure as regard the available hand hygiene facilities was calculated (fair if the total score is < 60%, good if the total score is 61-75%, very good if the total score is 76-85%, or excellent if the total score is >85%).

5. Calculation of Healthcare Associated (HA) MRSA incidence density ratio:

- Samples were collected for microbiological identification of MRSA from patients with clinically suspected infection from different sites (burn wound , blood , urine and sputum). All isolates were identified as *Staphylococcus aureus* and were tested for methicillin resistance by the Kirby Bauer disk diffusion method as per Clinical and Laboratory Standards Institute (CLSI) guidelines *(CLSI , 2006)* in the hospital's microbiology laboratory. HA MRSA infection referred to the MRSA infection diagnosed 48 hours after hospital admission.
- Patient demographic data (number of admissions ,age ,gender and patient days) was calculated.
- The incidence density ratio for HA MRSA was defined as the total number of new MRSA cases that arose from the defined population in the specified time period, divided by the sum of each individual's time at risk while remaining free of disease *(Nigel Bruce,2008)* , and was expressed as number per 1000-patient-days.

C. Data Collection:

The two methods used for measuring hand hygiene compliance were auditing and survey. According to the WHO guidelines, auditing (observation) is the "gold standard" for measuring hand hygiene adherence. It is the only way to directly measure health care workers' adherence to hand hygiene guidelines. Observation involves directly watching hand hygiene behavior and record the number of hand hygiene indications, opportunities, and actions. Observation was used also to asses structural considerations in the environment, for example, it was used to assess number of functioning sinks and their distribution, dispensers for liquid soap or alcohol-based hand rub (either wall mounted or freestanding), and whether they were functioning. A Survey in the form of a questionnaire was used to gather information on health care worker attitudes and practices related to hand hygiene (Gould, 2007).

1. Duration of data collection :

- The data was collected in 3 phases as follow:

- Phase 1: baseline data collection that lasted for 4 months (during measure and analyze steps)
- Phase 2: data collection during the improvement period that lasted for 4 months (during improve step)
- Phase 3: post intervention data collection that lasted for another 4 months (during control step)

- Each observation session lasted about 1 hour for a total of 20 sessions (20 hours)/ month with one observer assigned to each session who observed the burn ICU during the first half of the session and then moved to the burn ward , emergency room or operation theater in the second half.
- Observation sessions were scheduled at varied times throughout the day and night, both weekdays and weekends.
- All the observation session , throughout the three data collection phases , were carried out by the study members and the infection control nurses and the link nurse in charge who were sufficiently trained to use WHO HH observation forms. Observers were instructed to record only observations of clear opportunities or indications for HH that were either met or not met.

2. Data collection tools (Table 3):

Table 3: The monitoring tools used for data collection:

Type of Tool	Appendix	Name of Tool	Developer	Reference
Observation check list for indication, technique & ward facility of hand hygiene	1	WHO observation tools and calculation forms	WHO, world alliance for patient safety	http://www.who.int/gpsc/en/
	2	Hand hygiene technique audit tool	Study members	http://www.who.int/gpsc/en/
	3	ward structures for hand hygiene audit tool	Study members	- Egyptian ministry of health scoring tool -http://www.who.int/gpsc/en/
Knowledge `survey	4	WHO hand hygiene knowledge test for health care workers	- WHO, world alliance for patient safety (English questionnaire) – The study members translated the questionnaire into Arabic for nurses & housekeepers.	http://www.who.int/gpsc/en/

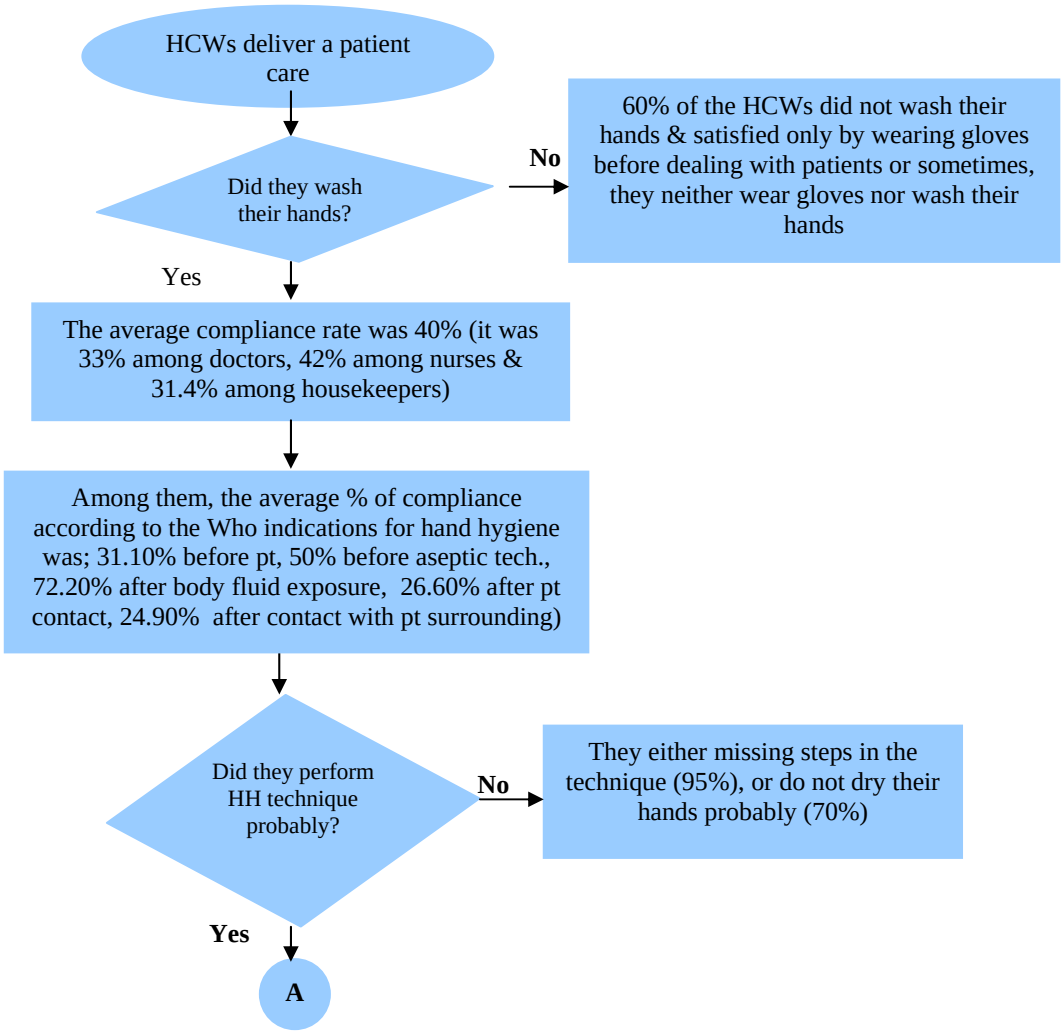
***Step II: Analyze :**

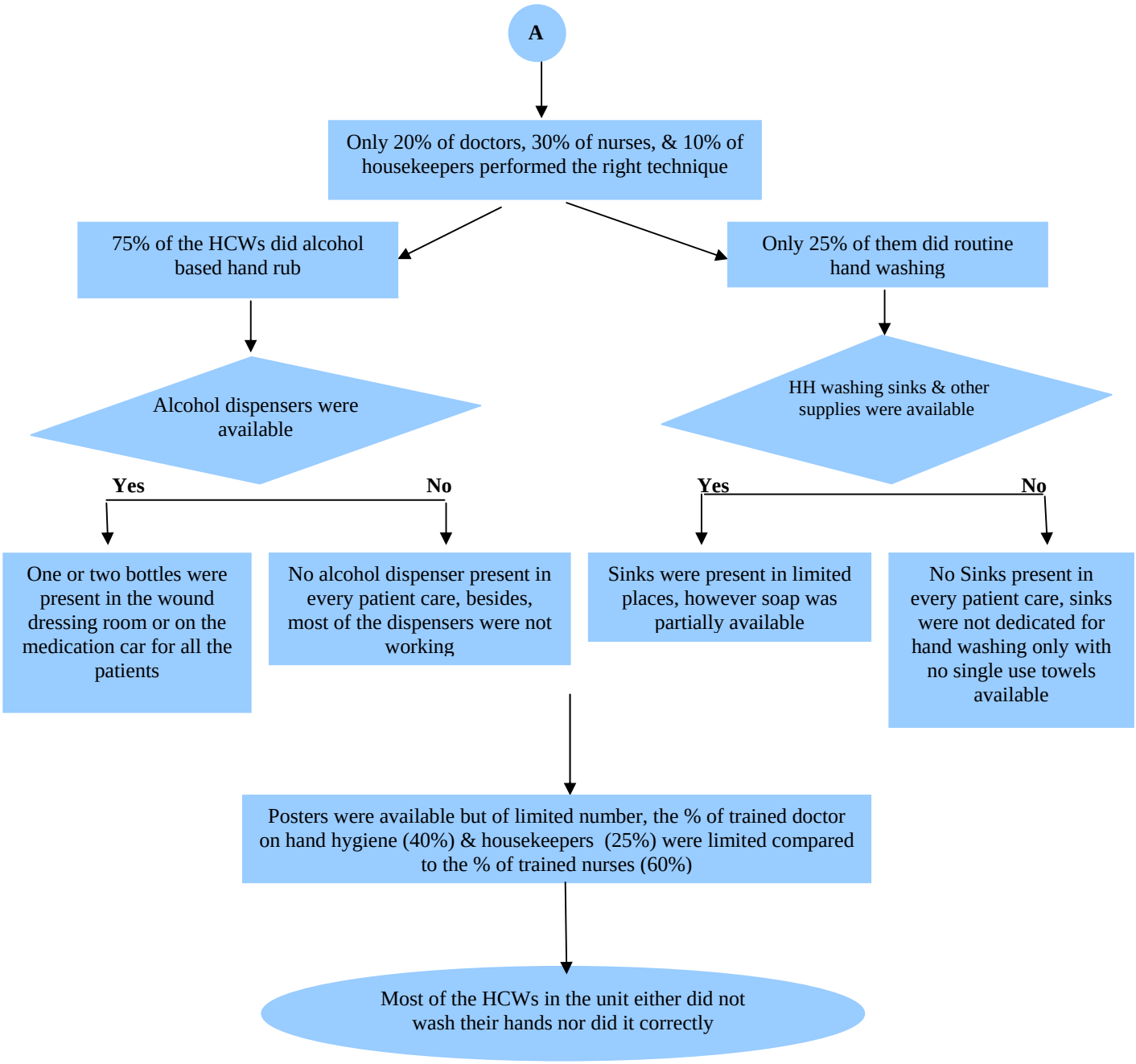
A. Brainstorming

During brainstorming sessions that lasted for about 20-30 minutes, study members discussed potential causes of low compliance percentage among burn unit staff. These causes were mainly related to inadequate knowledge and training of staff, defective hand washing facilities structure, shortage of H.H. supplies and lake of feedback monitoring system.

B. Definition of the problem boundaries

Through auditing of the process of hand hygiene in the burn unit, the following flow chart was done to summarizes the process and the most important results of measuring step

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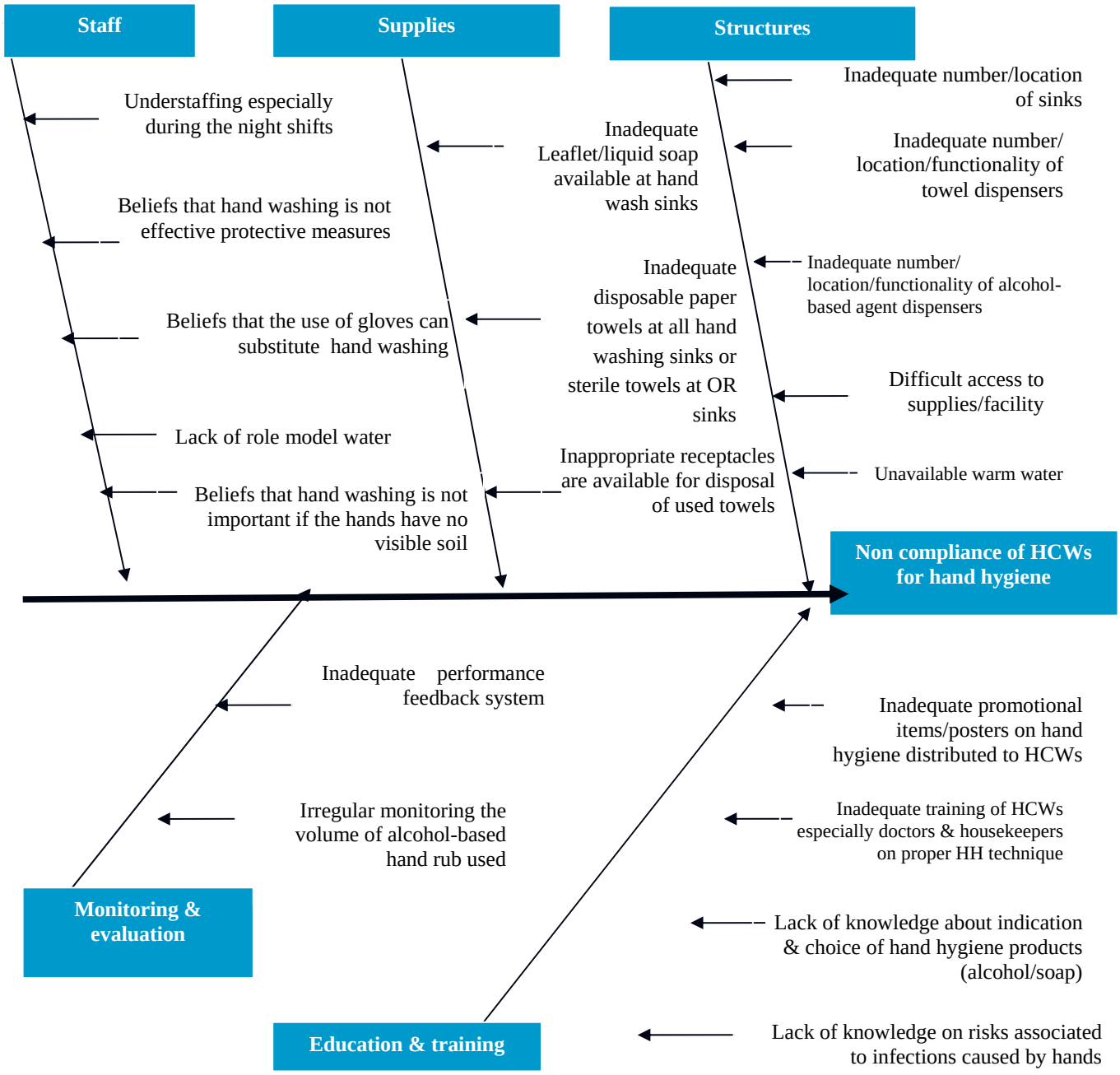
Only 20% of doctors, 30% of nurses, & 10% of housekeepers performed the right technique
75% of the HCWs did alcohol based hand rub
Only 25% of them did routine hand washing
Alcohol dispensers were available
HH washing sinks & other supplies were available
Yes
No
Yes
No
One or two bottles were present in the wound dressing room or on the medication car for all the patients
No alcohol dispenser present in every patient care, besides, most of the dispensers were not working
Sinks were present in limited places, however soap was partially available
No Sinks present in every patient care, sinks were not dedicated for hand washing only with no single use towels available
Posters were available but of limited number, the % of trained doctor on hand hygiene (40%) & housekeepers (25%) were limited compared to the % of trained nurses (60%)
Most of the HCWs in the unit either did not wash their hands nor did it correctly

C. Fish Bone Cause and Effect Diagram for hand washing non-compliance in the burn unit:



D. Root causes Identification

After brainstorming and through direct auditing and using checklists, the following factors for poor compliance were reported:

- Beliefs that wearing gloves obviates the need for hand hygiene.
- Lack of scientific information of definite impact of improved hand hygiene compliance on health care associated infection rates.
- Not thinking of HH or forgetfulness.
- Understaffing and overcrowding.
- No role model from colleagues.
- Inadequate supplies including liquid soap, paper towels and receptacles.
-Sinks are inconveniently located/shortage of sinks.
- Inadequate training of HCWs on proper hand hygiene technique.
- Inadequate promotional items/posters on hand hygiene distributed to HCWs.
-Inadequate performance feedback system.

***Step III: Improve:**

A. Establishment of a feedback based approach:

The first stage of the improvement was the feedback of the performance recorded during the baseline evaluation phase of the study. Feedback discussion forums were held with different staff categories. Emphasis was made on certain identified weaknesses as:

- Hand washing was the most breached infection control measure in burn unit.
- Staff culture and miss beliefs as regards the importance of hand hygiene were high lightened. For instance, most staff members didn't perceive in adherence to HH guidelines as a potential infectious risk. Also they were unaware of the implication of contacts with the environment in micro-organism transmission.
- Inadequacy of HH facilities and supplies, and their need for improvement. It was observed that hand washing required approximately 45 to 90 seconds to access and use a sink with running water, soap, and hand-drying facilities which was considered a burden to nursing staff in relation to their workload.
- Strength points as dedicated, interested staff and leadership commitment of senior staff and hospital administration were also emphasized as important driving forces for the improvement program.

B. Remedy Selection:

After reviewing the data collected and analyzing the results from audit tools and questionnaires used and with reference to the identified causes, the team decided that compliance to proper hand hygiene practices can be improved through different approaches, which would include some of the following remedies(Table 4):

Table 4 : Remedy Selection Matrix :

List of possible remedies	Total cost	Impact on the problem	Cultural resistance	Implementation time	Cost /Benefit	Total (50)
1-Arranging an educational program targeting proper HH practices.	10	8	5	7	10	40
2- On job training courses.	10	9	7	7	10	33
3- Posters and reminders.	8	8	8	10	8	42
4- Constructing new sinks.	2	5	4	4	6	21
5- Providing liquid soap dispensers.	8	10	10	10	10	48
6- Providing disposable towels dispensers.	5	5	4	7	5	26
7- Providing single use non-disposable towels.	8	9	8	8	10	43
8- Installing alcohol rub wall dispensers.	7	9	8	9	10	43
9- Providing pocket size alcohol rub bottles.	7	9	9	10	10	45
10- Providing a HH compliance feedback monitoring system.	9	9	6	8	10	42

C. Chosen Remedies:

Through the previous remedy selection matrix, each remedy was given a score from 1 to 10 as regards cost , impact on the problem , cultural resistance , time needed and cost benefit effectiveness . From this matrix , it was found that the appropriate approaches to improve hand hygiene compliance included arranging an educational program targeting proper HH practices, on job training courses, posters and reminders, providing liquid soap dispensers, providing single use non-disposable towels, installing alcohol rub wall dispensers, providing pocket size alcohol rub bottles, and providing a HH compliance feedback monitoring system. These were planned to be the remedies that would achieve the study's objective.

On the other hand it was found that constructing new sinks and providing disposable towels dispensers were unavailable remedies due to high cost. The construction of new sinks was not

feasible at the unit for the time being.

D. Remedy Customers:

Customers of the remedy included:

a- Those performing different parts of the planned remedies including study members, infection control staff at the unit, unit manager and head of nurses.

b- Those targeted by the study that will be served by different remedies including doctors, nursing, and housekeeping staff of the burn unit.

E. Remedy Design:

a- Our educational program was the cornerstone for improving HH compliance. Lectures were arranged addressing the following topics:

- Correction of misconceptions about the definitive impact of strict adherence to hand hygiene on reduction of the healthcare associated infection and the organism transmission rates.
- Improving awareness of HCWs about WHO guidelines for H.H. and raising knowledge concerning indications for HH during daily patient care (5 moments of HH).
- Knowledge concerning different types of hand hygiene products and their action.
- Stressing on the importance of hand hygiene despite the use of gloves

b- On the job training of physicians, nursing staff including registered nurses, assistants and housekeeping personnel. The training covered proper indications and techniques of hand washing and the proper use of alcohol hand rub.

c- Posters and reminders showing indications and steps of hand washing and alcohol hand rub were distributed including WHO 5 moments of hand hygiene poster (appendix 5).

d- Supplies were provided including:

- Liquid soap dispensers.
- Non-disposable single use towels.
- Receptacles for collecting used towels.
- Bedside alcohols rub wall dispensers.
- Pocket size alcohol rub bottles.

e- Performance monitoring tools were developed highlighting the significance of feedback monitoring system.

F. Culture Design:

- Physicians, nurses and housekeeping personnel were continuously educated about the importance of adherence to proper hand hygiene practices and the impact of selecting the appropriate method for H.H. in different indications.
- Hands-on instructions were provided regarding proper H.H. technique and proper use of alcohol hand rub during daily patient care activities.

G. Test Plan to Prove Effectiveness:

Using the audit tools used to measure baseline compliance ratio, it was found that H.H. compliance percentage was improved from 40% during the first phase of the project to 59.9% after the first month of the improvement phase. This verified that the implemented measures were effective and can be used to fulfill the study's objective.

H. Implementation Plan:

The study's objective was achieved through the following interventions:

- Eight multidisciplinary two-hour educational sessions were scheduled. Study members used data show presentations, films, practical demonstrations and question cards. All staff were re-educated on WHO guidelines for hand-washing and hand antisepsis (THE 5 MOMENTS FOR HH). Fact sheets with implications of poor HH and instructions for proper hygiene were distributed to all participating staff.
- Open discussion forums were held by study members to encourage sharing individual experiences which provided contextualized knowledge to all the participants.
- On job training was performed by team members while medical staffs were performing daily patient care activities.
- Posters and reminders showing indications and techniques of hand hygiene were distributed in patients' rooms, dressing room, nurse's room, ICU and emergency room.
- Verbal reminders were regularly provided by infection control nurses, link nurse and the head nurse.
- Instructions regarding proper use and maintenance of the available sinks were given.
- Providing products that meet acceptance of HCWs regarding its smell, consistency, ease of lathering (for liquid soap).
- Proper receptacles to collect used towels were provided.
- Bedside alcohol based wall dispensers were installed in every patient room. Proper use and maintenance of dispensers was observed as they may discourage use by HCWs when they become contaminated, blocked or don't deliver the product efficiently.
- Providing pocket size alcohol based hand sanitizer to staff and physicians.
- Head nurse was provided with checklists for careful monitoring of hand hygiene compliance and technique to exclude the negative effect of newly introduced hand washing devices. Head nurse and infection control link nurse were empowered to conduct feedback monitoring to sustain HCW's adherence to proper HH practice.
- Monthly HH compliance data (run charts and graphs) were disseminated to all staff members and

head of department to provide continuous feedback about the progress of the training program.
- An awarding system was implied among nurses in the form of announcing the nurse most adherent to proper HH practice. This made hospital leadership dedication visible to all participating staff which was important to sustain positive attitudes.

I. Measurable success:

After completion of the interventional educational program, a change in culture was noticed, this was subsequently impacted on improving compliance of HH from 40% to 61.9%.

***Step IV: Control:**

To sustain the improvement, the following measures were instituted:

- Selecting a dedicated HH improvement program follow up team including infection control nurses and the unit's link nurse.
- Maintaining administrative support and leadership commitment.
- Providing continuous regular educational and training sessions.
- Supplying new reminders with clear, to the point messages to maintain HH awareness.
- Establishing a continuous feedback system based on direct observation and data dissemination.
- Encouraging staff to adopt role model physicians and nurses with prominent HH compliance improvement.

- **Ethical considerations :**

This study was conducted with the approval of the authorized unit manager of the burn unit in Ain Shams University Hospital.

Explanation to the subjects was made by the responsible person to describe full details about the study, its benefits and how to complete the questionnaire. The collected data were kept in confidentiality to insure protection of privacy.

- **Statistical methods :**

IBMSPSS statistics (V.19.o, IBM Corp., USA, 2010) was used for data analysis. Data were expressed as both number and percentage for categorized data. The following tests were done:

1- Comparison between 2 proportions as regards univariant categorized data.
2- Chi-square test to study the association between each 2 variables as regards the categorized data. The probability of error at 0.05 was considered significant, while at 0.01 and 0.001 are highly significant and >0.05 was considered non significant.

3. Results:

1. Assessment of hand hygiene compliance:

Table 5: Total number of opportunities and actions observed and compliance percentage throughout the three phases of the study:

Months	No. of opportunities /month	No .of actions /month	Compliance%
October/2008	260	100	38.5%
November/2008	256	110	43%
December/2008	210	85	40.5%
January/2009	240	90	37.5%
Total over the baseline phase	966	385	39.8%
February/2009	242	145	59.9%
March/2009	215	142	66%
April/2009	258	156	60.4%
May/2009	260	161	61.9%
Total over the improvement phase	975	604	61.9%
June/2009	243	155	63.7%
July/2009	235	143	60.8%
August/2009	218	129	59.1%
September/2009	212	124	58.4%
Total over the control phase	908	551	60.6%

The table shows the total number of opportunities and actions observed monthly throughout the three phases of the study. Average compliance during the baseline phase was 39.8%, during the improvement phase was 61.9% while during the control phase it was 60.6%. Using comparison between 2 proportions showed that there was a highly significant difference between baseline phase and both, the improvement phase ($Z=9.7354$, $p<0.001$) and the control phase ($Z=9.0119$, $p<0.001$). On the other hand, there was no significant difference between improvement and control phases ($Z=0.5636$, $p>0.05$).

Figure 1 shows the rise in monthly HH compliance percentage, the trendline shows the increased compliance percentage during the improvement phase and the sustained increment during the control phase.

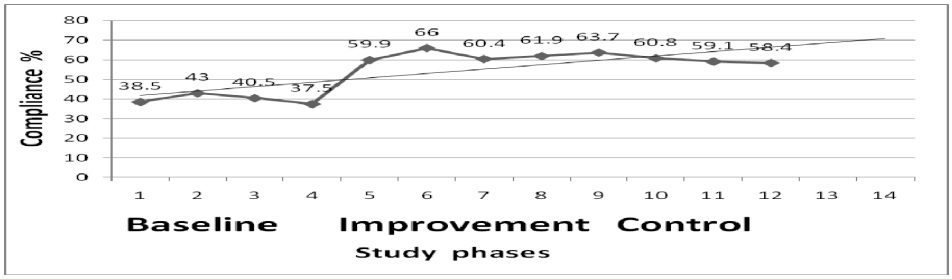


Fig.1: Run chart for average HH compliance percentage throughout the three phases of the study.

Table 6: HH compliance percentage among different professional categories during the baseline , improvement and control phases :

Phase / Category	Baseline			Improvement			Control		
	Opp.	actions	Compl.	Opp.	actions	Compl.	Opp.	actions	Compl.
Nurses	753	316	42.8%	731	461	63%	671	441	65.8%
Doctors	164	54	33%	163	92	56.4%	145	78	54%
Workers	49	15	31.4%	81	51	62.9%	92	32	35.4%
Total	966	385	39.8%	975	604	61.9%	908	551	60.6%

The table shows the compliance percentage among different professional categories throughout the study. As regards nurses, there was a highly significant difference between baseline phase and the improvement phase (Z=8.136, p<0.001) and between baseline phase and the control phase (Z=8.968, p<0.001). There was no significant difference between improvement and control phases (Z=1.038, p>0.05). The same results were observed as regards doctors, a highly significant difference was found between baseline and improvement phase (Z=4.2767, p<0.001) and between baseline and control phase (Z=3.7004, p<0.001) , while there was no significant difference between improvement and control phases (Z=0.4665, p>0.05). On the other hand, among workers, there was a highly significant difference between baseline and improvement phase (Z=3.5754, p<0.001) and between the improvement and the control phases (Z=3.702, p<0.001). There was no significant difference between baseline and control phases (Z=0.5002, p>0.05).

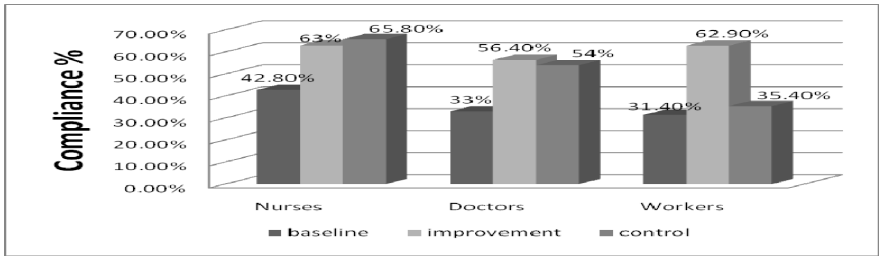


Fig.2: Comparison of HH compliance percentage among different professional categories during the baseline, improvement and control phase.

Figure 2 shows the increased HH compliance percentage during the improvement and the control phases among nurses and doctors , while among workers , the increased HH compliance percentage during the improvement phase was followed by a drop during the control phase.

Table 7: HH compliance percentage according to the WHO indications for HH during the baseline , improvement and control phase :

Phase / WHO indication	Baseline			Improvement			Control		
	Opp.	actions	Compl.	Opp.	actions	Compl.	Opp.	actions	Compl.
Before patient contact	346	108	31.1%	372	186	50%	297	143	48.3%
Before aseptic task	254	127	50%	189	144	76.4%	214	168	78.7%
After body fluid exposure	98	71	72.2%	103	76	74.2%	76	59	77.4%
After patient contact	468	124	26.6%	495	338	68.3%	422	279	66%
After contact with patient surroundings	54	13	24.9%	47	21	45%	38	16	42.5%

The table shows the number of opportunities and actions observed for each of the WHO 5 moments for HH indications, and their calculated compliance percentage:

- Before patient contact indication showed a highly significant difference between baseline phase and both improvement phase (Z=5.1471,p<0.001) and control phase (Z=4.4571,p<0.001), while a non significant difference was found between improvement and control phases (Z=0.4369, p>0.05).
- Before aseptic task indication showed a highly significant difference between baseline phase and both improvement phase (Z=5.6414,p<0.001) and control phase (Z=6.4108,p<0.001), while a non significant difference was found between improvement and control phases (Z=0.5528,p>0.05).
- After body fluid exposure indication didn't show a significant difference between neither of the three phases. A non significant difference was found between baseline phase and both improvement phase (Z=0.32, p>0.05) and control phase (Z=0.78, p>0.05) . Also a non significant difference was found between improvement and control phases (Z=0.49,p>0.05).
- After patient contact indication showed a highly significant difference between baseline phase and both improvement phase (Z=12.94,p<0.001) and control phase (Z=11.79 ,p<0.001), while a non significant difference was found between improvement and control phases (Z=0.7396, p>0.05).
- After contact with patient surroundings indication showed a significant difference between baseline phase and both improvement phase (Z=2.123,p<0.05) and control phase (Z=1.779 ,p<0.05), while a non significant difference was found between improvement and control phases (Z=0.23 ,p>0.05).

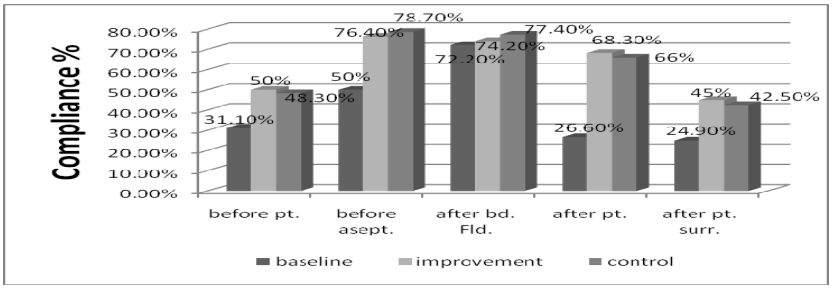


Fig.3: Comparison of HH compliance percentage according to WHO 5 moments of HH indications during the baseline , improvement and control phase.

Figure 3 shows the comparison of HH compliance percentage according to WHO 5 moments of HH indications during the baseline, improvement and control phase. There was an increase in HH compliance percentage as regards before patient contact, before aseptic task, after patient contact and after contact with patient surroundings indications, however no change in HH compliance was noticed as regards after body fluid exposure indication.

Table 8 :Comparison of the number of actions in which HCW used alcohol hand rubbing versus the number of actions in which HCW used hand washing: Using CROSSTAB /CHI- SQUARE TEST (Cell format: count , percent: total ,percent: row, percent :column).

Phase / Item	Baseline	improvement	Total	aseline	control	Total	Improvement	Control	Total
Alcohol hand rubbing	288 29.12 45.14 74.81	350 35.39 54.86 57.95	638 64.51	288 30.77 43.84 74.81	369 39.42 56.16 66.97	657 70.19	350 30.30 48.68 57.95	369 31.95 51.32 66.97	719 62.25
Hand washing	97 9.8 27.6 25.19	254 25.6 72.36 42.05	351 35.49	97 10.36 34.77 25.19	182 19.44 65.23 33.03	279 29.81	254 21.99 58.26 42.05	182 15.76 41.74 33.03	436 37.75
Total	385 38.93	604 61.07	989 100	385 41.13	551 58.87	936 100	604 52.29	551 47.71	1155 100
X^2 P Significance	X^2 P<0.001 Highly significant			X^2 P<0.001 Highly significant			X^2 P<0.001 Highly significant		

The table shows that there was a highly significant difference as regards the use of alcohol hand rub versus hand washing during the three phases. The use of alcohol hand rub during baseline phase represented 74.81% (no.=288) in comparison to hand washing which represented 25.19% (no.=97) , however during improvement phase there was a drop in alcohol hand rub which represented 57.95% (no.=350) with corresponding increase in hand washing which represented 42.05% (no.=254). Also, when comparing baseline and control phases, the table illustrates that during control phase alcohol represented 66.97%(no.=369) with corresponding increase in hand washing which represented 33.03%(no.=182). On comparing improvement and control phases , alcohol hand rub use increased from 57.95% (no.=350) during improvement phase to 66.97%(no.=369) during control phase , while hand washing dropped from 42.05%(no.=254) during improvement phase to 33.03%(no.=182) during control phase.

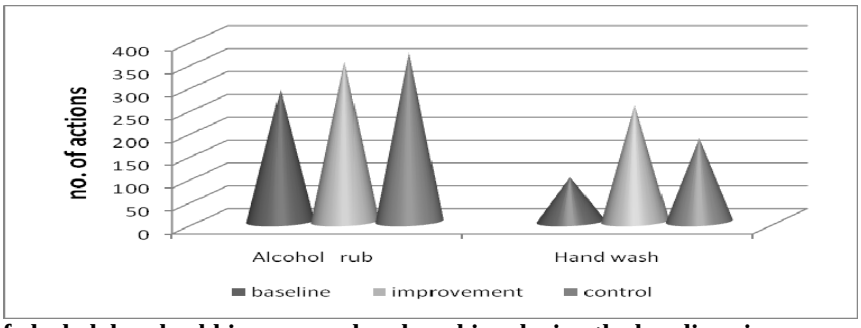


Fig.4: The use of alcohol hand rubbing versus hand washing during the baseline , improvement and control phase.

2. Evaluation of performing right HH technique:

Table 9 : Comparison of the number of personnel performing right HH technique among different professional categories during the baseline , improvement and control phase :

Phase / Category	Baseline	improvement	Z & p value	Baseline	control	Z & p value	Improvement	Control	Z & p value
Nurses (no.20)	6	16	Z=3.17 P<0.01	6	17	Z=3.51 P<0.001	16	17	Z=0.41 P>0.05
Doctors (no.10)	2	5	Z=1.40 P>0.05	2	5	Z=1.40 P>0.05	5	5	Z=0 P>0.05
Workers (no.4)	1	2	Z=0.73 P>0.05	1	3	Z=1.41 P>0.05	2	3	Z=0.73 P>0.05

The table shows that there was a highly significant difference between baseline and both improvement and control phases as regards the number of personnel performing right HH technique among nurses (p<0.01) , while no significant difference was found between improvement and control phases (p>0.05). On the other hand, no statistically significant difference was found between the three phases among doctors and workers (p>0.05).

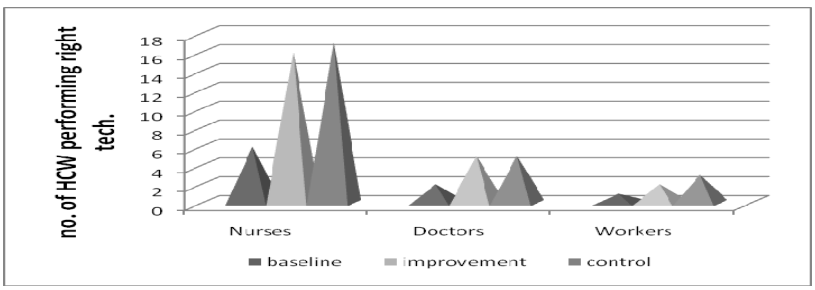


Fig.5: Comparison of the number of personnel performing right HH technique among different professional categories during the baseline, improvement and control phase.

3. Evaluation of personnel orientation with the WHO 5 moments for hand hygiene:

Table 10: Comparison of the number of personnel oriented with the WHO 5 moments for HH among different professional categories during the baseline , improvement and control phase :

Phase / Category	Baseline	improvement	Z & p value	Baseline	control	Z & p value	Improvement	Control	Z & p value
Nurses (no.20)	8	18	Z=3.31 P<0.01	8	19	Z=3.71 P<0.001	18	19	Z=0.6 P>0.05
Doctors (no.10)	3	7	Z=1.78 P<0.05	3	8	Z=2.24 P<0.05	7	8	Z=0.51 P>0.05
Workers (no.4)	1	3	Z=1.41 P>0.05	1	2	Z=0.73 P>0.05	3	2	Z=0.73 P>0.05

The table shows that there was a highly significant difference between baseline and both improvement and control phases as regards the number of personnel oriented with the WHO 5 moments for HH among nurses ($p<0.01$) , while no significant difference was found between improvement and control phases($p>0.05$). As regards doctors , there was a significant difference between baseline and both improvement and control phases ($p<0.05$), and no statistically significant difference was found between improvement and control phases($p>0.05$). No statistically significant difference was found between the three phases among workers ($p>0.05$) .

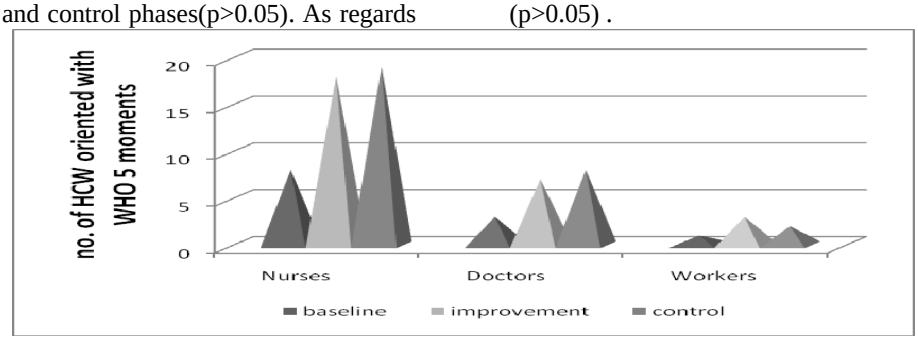


Fig.6: Comparison of the number of personnel oriented with the WHO 5 moments of HH among different professional categories during the baseline, improvement and control phase.

Evaluation of hand hygiene facility structure, supplies, availability of educational & training materials, & presence of monitoring& evaluation:

Table 11 : Comparison of hand hygiene facility structure, supplies, availability of educational & training materials, & presence of monitoring& evaluation during the three phases:

Phase / Item	Baseline	improvement	Z & p value	Baseline	Control	Z & p value	Improvement	Control	Z & p value
Structure (Total 24)	12	17	Z=1.47 P>0.05	12	18	Z=1.78 P<0.05	17	18	Z=0.32 P>0.05
Supplies (Total 14)	7	10	Z=1.16 P>0.05	7	12	Z=2.02 P<0.05	10	12	Z=0.92 P>0.05
Educational & training materials (Total 10)	5	9	Z=1.95 P<0.05	5	8	Z=1.4 P>0.05	9	8	Z=0.62 P>0.05
Monitoring& evaluation (Total 6)	2	5	Z=1.75 P<0.05	2	6	Z=2.44 P<0.01	5	6	Z=1.04 P>0.05

The table illustrates the comparison between the three phases as regards hand hygiene facility structure, supplies, availability of educational & training materials, & presence of monitoring& evaluation:

- HH facility structure didn't show a statistically significant difference between baseline and improvement phases or between improvement and control phases ($P>0.05$). A statistically significant difference was found between baseline and control phases ($P<0.05$).
- Supplies didn't show a statistically significant difference between baseline and improvement phases or between improvement and control phases ($P>0.05$). A statistically significant difference was found between baseline and control phases ($P<0.05$).

- Educational & training materials didn't show a statistically significant difference between baseline and control phases or between improvement and control phases (P>0.05). A statistically significant difference was found between baseline and improvement phases (P<0.05).

- Monitoring& evaluation show a statistically significant difference between baseline and improvement phase (P<0.05) and a highly significant difference between baseline and control phases (P<0.01).

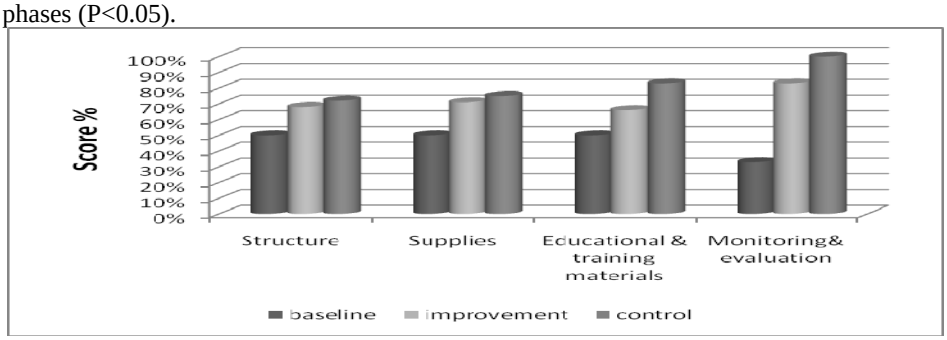


Fig.7: Comparison of hand hygiene facility structure, supplies, availability of educational & training materials, & presence of monitoring& evaluation during the baseline, improvement and control phase.

5. Calculation of Healthcare Associated (HA) MRSA incidence density ratio:

- Table 12: Number of admissions, patient days, infected cases and HA MRSA and comparison of HA MRSA incidence among the three phases:

Phase / Item	Baseline 1st October 2008 - 31st January 2009	Improvement 1st February 2009 - 31st May 2009	Baseline 1st October 2008 -31st January 2009	control 1st June 2009 - 30th September 2009	improvement 1st February 2009 - 31st May 2009	Control 1st June 2009 - 30th September 2009
Number of admissions Total=257	92	86	92	79	86	79
Patient days Total=3440	1156	1089	1156	1195	1089	1195
Number of HA infections Total=106	45	32	45	29	32	29
Number of HA MRSA cases Total=31	12	9	12	10	9	10
HA MRSA incidence density ratio per 1000 patient days	10.3	8.2	10.3	8.3	8.2	8.3
Z P Significance	Z=0.520562 p>0.05 non significant		Z=0.506655 p>0.05 non significant		Z=0.027263 p>0.05 non significant	

The table shows that the total number of admissions during the study period was 257 (189 were males and 68 were females) with ages ranging between 12 and 62 (mean was 43±6.4). The total number of HAI (onset 48 hours after admission) was 106 , from which 31 cases were HA MRSA (17 burn wound infections , 7 bloodstream infections, 5 catheter associated urinary tract infections and 2 lower respiratory tract infections) . There was a drop in HA MRSA incidence density ratio per 1000 patient days from 10.3 during baseline phase to 8.2 during the improvement phase and 8.3 during the control phase , however the difference was statistically non significant .

4. Discussion:

The present study was a direct observational before–after study to assess the improvement of HH compliance , through a multi-faceted training program , was implemented at the burn unit in a tertiary referral teaching hospital in Cairo. The unit consists of a ward with the capacity of 12 beds, an ICU with the capacity of 5 beds, emergency room with the capacity of 1 bed, and 1 operation theatre. It was carried out during the period from October 2008 till September 2009. The improvement intervention included lectures, on job training, distributing factsheets and reminders and providing HH supplies as alcohol hand rub dispensers.

Adherence to proper hand hygiene practice (compliance and technique) was assessed throughout

the three phases of the study through direct observation by observers well trained on using WHO HH observation forms to register and calculate observed HH opportunities, actions and indications among different professional categories. Observation sessions were scheduled at varied times throughout weekdays and weekends to assure accurate estimation of the hand hygiene compliance. This was also postulated by Kakeya and Senda (2004) who examined nurses' compliance with hand washing in 6 clinical scenes using both a questionnaire and observation, and reported compliance rates of 83.5% based on the questionnaire conducted among 39 nurses, and 68.9% based on the observation of 20 nurses. Thus, since questionnaires resulted in a higher compliance rate than observation, an accurate estimation of the hand hygiene compliance rate should be made based on observation.

As regards average HH compliance, an overall increase was noticed from 39.8% during the baseline phase to 61.9% during the improvement phase ($P < .001$) after the start of the multidisciplinary training program. Furthermore, the improvement was sustained during the control phase (HH compliance was 60.6%).

This was in agreement with the study of Allegranzi et al . (2010), which revealed that, as a result of intervention including education, compliance increased from 8.0% at baseline to 21.8% at follow-up ($P<.001$). McLaws et al.(2009) reported an overall hand hygiene compliance rate improvement from 47% before the intervention to an average of 61%($P < 0.001$). Also hand hygiene compliance rate improvement from49% to 98% was observed by Lederer et al.(2009) , from 23.1% (268/1160) to 64.5% (2056/3187) ($P < .0001$) by Rosenthal et al.(2005) and from a pre-intervention mean of 21% to 42% 12 months post-intervention ($P < 0.001$) by Johnson et al. (2005).

It was also reported that implementation of a multifaceted interventional behavioral hand hygiene program resulted in an overall improvement in compliance with hand hygiene guidelines from 51 to 83% ($P < 0.001$) (Creedon ,2005) and that compliance improved progressively from 48% in 1994, to 66% in 1997 ($p<0.001$) (Pittet et al., 2000).

However , Raskind et al.(2007) observed only an initial improvement in the rate of compliance at 1 month after the intervention from 89% [168 of 189 opportunities] to 100% [212 of 212 opportunities] ($P<.001$) followed by a decrease to the baseline rate of 89% [85 of 96 opportunities] after 3 months duration. Also after estimation of baseline compliance (20%), an intervention based on visual cues , in the form of 11" x 17" posters , resulted in a modest improvement of HH compliance to 37% during a 12-month study (Thomas et al., 2005). Similarly, a mild improvement in compliance from 44.2% before the first intervention, 42.3% between interventions, and 48% after the second intervention was reported by Brown et al. (2003).

Furthermore, in the study of Harbarth et al. (2002) baseline compliance decreased after the first 2 weeks of observation from 42.5% to 28.2% further decreased to 23.3% in the limited intervention phase and increased to 35.1% after the introduction of a hand gel . The rise in compliance persisted in the last phase (compliance, 37.2%); however, a gradual decline was observed during the final weeks.

On comparing the HH compliance percentage among different professional categories throughout the study, nurses showed a highly significant increase from baseline (42.8%) to improvement phase (63%) ($Z=8.136$, $p<0.001$) which continued throughout the control phase (65.8%) ($Z=8.968$, $p<0.001$). The same results were observed as regards doctors. On the other hand, among workers, the increased compliance noticed from baseline (31.4%) to improvement phase (62.9%) ($Z=3.5754$, $p<0.001$) was followed by a drop during the control phases (35.4%) ($Z=3.702$, $p<0.001$).

This was in accordance with the findings of Saint et al.(2009) .They reported overall HCW hand hygiene increase from 31.5% to 47.4% ($p<0.001$). HH adherence among nurses increased from 33.7% to 47.9% ($p<0.001$); and among doctors from 27.5% to 46.6% ($p<0.001$). In another study the rate of compliance with hand washing and glove use was 34.0% with no significant differences between job types (Takahashi et al., 2009).

In a study conducted in three long-term-care facilities in Taiwan, Huang and Wu (2008) demonstrated that the nursing assistants had significantly more knowledge and better compliance three months after HH training than before intervention.

On the other hand McLaws et al.(2009) observed that all professional groups sustained improved compliance rates except medical staff, whose practices reverted to pre-intervention rates. Nursing staff maintained significantly improved compliance, with an average rate of 67% after the intervention. The same was demonstrated by the study of Duggan et al.(2008) in which nurses showed statistically significant improvement in their rate of hand hygiene compliance (91.3%) but no improvement was seen for attending physicians (72.4%; $P<.001$). Medical attending physicians had the lowest observed rate of compliance . Thus, an inverse correlation existed between the level of professional education and the rate of compliance. However , in another study, doctors were more likely

to adhere to HH protocols than nurses (83.3% vs. 66%) (Samraj et al.,2008).

The present study also demonstrated that according to WHO 5 moments for HH indications , compliance related to before patient contact , before aseptic task and after patient contact indications showed a marked increase from baseline to improvement and control phases ($p<0.001$) . After contact with patient surroundings indication showed a less marked improvement ($p<0.05$) .On the contrary, compliance related to the after body fluid exposure indication was high from the start and didn't show significant increase throughout the study . This may reflect HCW's perception of the hazards of body fluid exposure.

Similar results were obtained by McLaws et al.(2009) where overall HH compliance before patient contact improved from 39% (pre-campaign) to 52% ($P < 0.001$) and after patient contact improved from 57% to 64% ($P < 0.001$) over the same period. It was also reported that compliance improvement with direct patient contact was sustained over time (49% at baseline versus 64% at last follow-up survey; $P < .001$) , however compliance with hand hygiene after contact with surroundings remained stable across the study (Pessoa-Silva et al.,2007).

In another study an increase in difference between the compliance after contacts and the compliance before contacts from the baseline phase of the study to the post-intervention phase was interpreted by Whitby et al. (2006) by a hypothesis that the motivation for performing HH was influenced more by an inherent desire to clean oneself when feeling dirty(after contact) than by an interest in protecting the patient (before contacts). Similarly, the study of Lam et al.(2004) demonstrated an overall hand hygiene compliance increase from 40% to 53% before patient contact and from 39% to 59% after patient contact.

The use of alcohol hand rub versus hand washing was compared during the three phases of the study. The use of alcohol hand rub during baseline phase represented 74.81% (no.=288) in comparison to hand washing which represented 25.19% (no.=97) , however during improvement phase there was a drop in alcohol hand rub which represented 57.95% (no.=350) with corresponding increase in hand washing which represented 42.05%(no.=254). This was attributed to the increased perception of HCWs to the importance of hand washing in some situations in which it can't be substituted by alcohol hand rub, as in case of visibly soiled hand or after pilling up of powder due to repeated glove changes . However ,on comparing improvement and control phases , alcohol hand rub use increased from 57.95% (no.=350) during improvement phase to 66.97%(no.=369) during control phase , while hand washing dropped from 42.05%(no.=254) during improvement phase to 33.03%(no.=182) during control phase. This was related to the accessibility and less time consumption related to alcohol use.

This observation was supported by the previous study of Pessoa-Silva et al.(2007) who reported that hand-rubbing was used in 91% (2315 of 2550) of all hand hygiene actions. Overall compliance improved significantly across the 3 study phases and paralleled the increase in hand-rub consumption . Hand-rub use increased in phase 2 (intervention period) versus phase 1 ($P = 0.025$) and continued to increase in phase 3 (follow-up) versus phase 2 ($P = 0.037$). In another study, use of alcohol rose from 15.2% of HH indications to 25.2% between interventions and 41.5% after the second intervention (Brown et al.,2003). The same was observed by Harbarth et al.(2002) and Pittet et al.(2000) who declared that the frequency of hand disinfection substantially increased during his study period ($p<0.001$).

In the present study, nurses showed the greatest improvement as regards the number of personnel performing right HH technique and the number of personnel oriented with the WHO 5 moments for HH ($p<0.01$) . Doctors demonstrated a less marked improvement as regards orientation with WHO 5 moments for HH ($p<0.05$). No significant improvement was recorded among workers as regards the two parameters ($p>0.05$) , this is due to the small sample size (4 workers). Knowledge was also found to be enhanced significantly after intervention($P < .05$) by Allegranzi et al.(2010). Huang and Wu (2008) stated that three months after hand-hygiene training the nurse assistants had significantly more knowledge (from 13.82 to 15.41, $P<0.001$) and better compliance (from 9.34% to 30.36%, $P<0.001$) than before the intervention.

In the study done by Patarakul et al.(2005) almost all subjects (99.7%) claimed to know correct hand-hygiene techniques. Handwashing with medicated soap was perceived to be the best mean of hand decontamination (37.8%). Furthermore, healthcare workers believed that their skin condition improved ($P < 0.001$). An increase in knowledge about handwashing guidelines was also found (Creedon , 2005).

There was improvement in most aspects of hand-washing technique in the postintervention stage (Lam et al., 2004). It was also observed that HH improved significantly among nurses and nursing assistants, but remained poor among doctors (Pittet et al., 2000).

As regards hand hygiene facility structure,

supplies, availability of educational & training materials, & presence of monitoring& evaluation, educational & training materials showed significant improvement during the improvement phase with the start of the training program (P<0.05). However , the improvement in HH facility structure and supplies wasn't apparent till the control phase after installation of bedside wall mounted alcohol dispensers , providing single use hand towels and receptacles to collect used ones and establishing principles for proper use and maintenance of hand washing sinks that were defective during the baseline phase (P<0.05). Monitoring& evaluation showed a highly significant improvement during the control phase after training link nurses to use WHO observation forms and implementation of feedback approach between link nurses and HCWs.

Severe deficiencies in the infrastructure for hand hygiene were identified before the intervention by Allegranzi et al.(2010). Local handrub production and quality control proved to be feasible, affordable, and satisfactory. At follow-up, handrubbing was the quasi-exclusive hand hygiene technique (93.3%).

Unexpectedly, availability of a wearable dispenser was not associated with a significant improvement in use of alcohol products for HH. Greater success in sustaining increased HH compliance has been reported with use of multimodal approaches in which increased availability of HH alcohol products may be a part of the intervention (Haas and Larson, 2008). Introduction of AHR without an associated behavioral modification program proved ineffective (Whitby et al.,2008).

The importance of monitoring the compliance of care staff with hand hygiene was emphasized as a means to maintain and improve the compliance rate . Evaluation of hand-washing activities was found to be a factor increasing hand hygiene rate as well. Hand washing can be evaluated by such methods as self-evaluation by a check sheet and direct observation (Pittet et al .,2000).

MRSA infections are the most common HAI in the acute care setting. The major mode of transmission from patient to patient is through bedside care providers via contaminated hands (Lederer et al.,2009). Therefore, in the present study HA MRSA incidence density ratio per 1000 patient days was calculated to demonstrate the effect of the HH improvement program on HA MRSA acquisition . On comparing the three phases of the study as regards HA MRSA incidence density ratio per 1000 patient days , a drop was observed from 10.3 during baseline phase to 8.2 during the improvement phase and 8.3 during the control phase , however the difference was statistically non significant . The study by Lederer et al.(2009) demonstrated that MRSA rates decreased from 0.52 HAIs per 1,000 patient days in 2005 to 0.24 HAIs per 1,000 patient days by year-end 2008. Similarly , Johnson et al.(2005) reported significant reductions in hospital-wide rates of total clinical MRSA isolates (40% reduction; P < 0.001) and patient-episodes of MRSA bacteraemia (57% reduction; P = 0.01). These findings were in agreement with the study of Pessoa-Silva et al.(2007) , in which the overall rates of health care–associated infection per 1000 patient-days across the HH improvement study phases were 11.1 (48 of 4322), 7.9 (70 of 8846), and 8.2 (32 of 3898) in phases 1, 2, and 3, respectively.

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Appendices
Appendix1
WHO observation tools and calculation forms (Form1, 2, 3)
Form1

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

ANNEX 34

OBSERVATION FORM

Country	City	Hospital	Site ID

Observer (initials)			
Date (dd.mm.yyyy) . .	Period No.	Department	
Start/End time (hh:mm) : / :	Session No.	Service name	
Session duration (mm)	Form No.	Ward name	

Prof.cat. / Code / Number	Prof.cat. / Code / Number	Prof.cat. / Code / Number	Prof.cat. / Code / Number

Opp	Indication	Action	Opp	Indication	Action	Opp	Indication	Action	Opp	Indication	Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed
8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.fluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash O missed

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WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

OBSERVATION FORM

Form 1 cont.

General recommendations (refer to chapter 2.2 of the Reference Manual for Observer)

1. Introduce yourself to the observed health-care workers and patients as appropriate and indicate the reason for your presence.
2. You may observe up to 3 health-care workers simultaneously if the density of action permits.
3. You may include more health-care workers sequentially during one observation session.
4. Find a convenient place to observe without disturbing care activities; you can move to follow the health-care workers, but never interfere with their work. However, you can provide feedback after the session.

How to use the form (refer to chapter 2.2 of the Reference Manual for Observer)

5. Use a pencil to fill in the form and a rubber to correct errors; use a rigid support to hold the form (during observations).
6. Complete the details at the top of the form (except end time and session duration).
7. As soon as you count the first opportunity for hand hygiene, indicate the corresponding information (indication(s), action) in the first of the numbered opportunity boxes that read from top to bottom. Enter it in the column corresponding to the professional category of the observed health-care worker.
8. Each opportunity refers to one line in each column; each line is independent from one column to another.
9. Put a cross in the small square or circle corresponding to the correct item (the square means several items can be chosen; the circle means only one item can be chosen).
10. In the case of several indications falling into one opportunity, cross the square corresponding to each indication.
11. Performed or missed actions must always be registered within the context of an opportunity.
12. Do not forget to note the end time, to calculate the session duration and to check data before returning the form.

Short description of items (refer to chapter 2.2 of the Reference Manual for Observer)

Country / City:	give in full (do not use abrevations)	
Hospital:	give in full (do not use abrevations)	
Site ID:	according to WHO codes (provided by co-ordinator).	
Observer:	initials (first name / family name).	
Date:	day / month / year.	
Start / End-time:	hour / minute.	
Session duration:	difference between start and end time, result in minutes.	
Period No:	according to the institutional counter.	
Session No:	according to the institutional counter.	
Form No:	number of pages.	
Department:	according to the following nomenclature:	
	medical (including dermatology, neurology, haematology, etc.)	surgical (including ENT, ophthalmology, eurosurgery, etc.)
	mixed (medical & surgical)	obstetrics (including related surgery)
	paediatrics (including related surgery)	ICU
	emergency unit	long term & rehabilitation
	outpatient clinic (including related surgery)	other (to specify)
Service / Ward name:	according to the institutional nomenclature.	
Prof. Cat. / Code:	**according to the following classification:**	
	1. nurse / midwife	1.1 nurse, 1.2 midwife, 1.3 student,
	2. auxiliary	
	3. medical doctor	3.1 in clinical medicine, 3.2 surgeon, 3.3 anaesthetist, 3.4 paediatrician, 3.5 other, 3.6 medical student
	4. other health-care worker	4.1 therapist (physiotherapist, occupational therapist, audiologist, speech therapist, etc.) 4.2 technician (radiologist, cardiology technician, operating room technician, cardiology technician, laboratory technician, etc.) 4.3 other (dietician, dentist, social worker and any other health-related professional involved in patient care)
Number:	enter the number of observed health-care workers belonging to the same professional category (same code) as they enter the field of observation	
Opportunity:	defined by at least one indication.	
Indication:	motivates the hand hygiene action	
	bef-pat.: before patient contact	aft-bfluid: after body fluid exposure risk
	bef-asept.: before an aseptic task	aft-pat.: after patient contact
		aft-surr.: after contact with patient surroundings
Action:	response to the hand hygiene indication(s)	
	rub: when hand hygiene is performed with an alcohol-based formulation	**missed:** when no action is performed
	wash: when hand hygiene is performed with soap and water	

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

OBSERVATION FORM

Form 2: calculation form for compliance % in each professional category

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

BASIC CALCULATION FORM

Country	City	Hospital	Site ID

Date (dd.mm.yyyy)	Period N°.	Department Service Ward

Session N°.	Professional categories (columns can be added according to the number of professional categories observed)								Total of sessions	
	Prof.cat. Code		Prof.cat. Code		Prof.cat. Code		Prof.cat. Code			
	Opportunity	Action	Opportunity	Action	Opportunity	Action	Opportunity	Action	Opportunity	Action
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
Total by categories										
Compliance										

$$\text{Compliance (\%)} = \frac{\text{Actions}}{\text{Opportunities}} * 100$$

Instructions for use

1. Check data collected in observation form. Calculate the sums of the opportunities and actions according to the professional category from each observation session and copy the results on the lines corresponding to the session number.
2. Calculate the sum of the opportunities and the sum of the actions along the lines to obtain the total sum of each session.
3. Calculate the sum of opportunities and actions of all sessions and the overall compliance by applying the equation above.
4. Calculate the sums of the opportunities and actions over all professional categories and calculate compliance by categories by applying the equation. Complete result on the «Compliance» line and in each «Total by categories» column.

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BASIC CALCULATION FORM

Form 3: calculation form for compliance % among professional categories for each indication

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

OPTIONAL CALCULATION FORM

(Indication related compliance with hand hygiene)

Country	City	Hospital	Site ID

Date (dd.mm.yyyy)	Period N°.	Department Service Ward

Session N°.	Hand Hygiene Indications									
	Before patient contact		Before an aseptic task		After body fluid exposure risk		After patient contact		After contact with patient surroundings	
	Number	Action	Number	Action	Number	Action	Number	Action	Number	Action
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
Total by indications										
Compliance										

$$\text{Compliance (\%)} = \frac{\text{Actions}}{\text{Indications}} * 100$$

Instructions for use

5. Check data collected in observation form. Calculate and copy the sums of indications and its regarding actions from each observation session.
6. If several indications occur within a same opportunity, each one should be considered separately as well as the related action.
7. Apply the compliance equation to calculate the compliance per indication and copy the results on the «Compliance» line and in the corresponding columns.

Note : This calculation is not exactly a compliance result, as the denominator of the calculation is an indication instead of an opportunity. Action is artificially over estimated according to each indication. However, the result gives an overall idea of health-care worker's behaviour towards each type of indication.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

OPTIONAL CALCULATION FORM

Appendix 2

Hand hygiene technique audit tool Date…/…/… Time…… Staff category

		Score		
I- Hand Preparation		**0**	**1**	**2**
	No wrist watches, wrings or jewelry are worn by staff carrying out patient care			
	Staff nails are short, clean and free from nail varnish			
	Artificial nails are not worn			
	Total			**/ 6**
II- Hand washing technique	Regulates water temperature until it feels warm.			
	Allow warm water to flow over each hand			
	Dispenses appropriate amount of liquid soap into palm of one hand.			
	Rub palms together using friction and circular movement. with interlacing fingers			
	Rubs back of each hand 3-5 times with interlacing fingers			
	Rub back of fingers to opposite palm with fingers interlocked			
	Washes tips of fingers by rotational movement into the centers of the two palms			
	Washes both thumbs with rotational movements			
	Washes wrists			
	Rinses hands, wrists and nails under running water with fingertips pointed up.			
	Total			**/ 20**
III- Drying of Hands	Chooses single use towel.			
	Starts at fingers and move up to wrists to dry.			
	Uses the towel to turn off faucet			
	Places used towels into appropriate receptacle.			
	Total			**/ 8**
Hand Hygiene using Alcohol based hand rubs	Alcohol based hand rub is dispensed onto the hands			
	Alcohol hand rub is rubbed onto the hands ensuring all surfaces are covered by the alcohol for 30 sec			
	Hands are rubbed until the alcohol has evaporated			
	Total			**/ 6**

Appendix 3

Ward structures for hand hygiene audit tool Ward…… Date…/…/… Time…… Fulfilled by…

		Score		
I-Structure of hand wash facilities		**0**	**1**	**2**
	1 sink is available for each 4-6 beds	0		
	Access to hand wash sinks is clear	0		
	Water is regularly available			2
	Running water is available			2
	Foot or elbow control is available for OR sinks			2
	Hand wash sinks are dedicated for that purpose only		1	
	The hand wash sinks are free from any inappropriate items or equipments		1	
	There is appropriate temperature control to provide suitable hand wash water at all sinks	0		
	There are no brushes on hand wash sinks in clinical areas			2
	Dispensers for soap or alcohol are available		1	
	If wall dispensers are available, they are placed within an arm reach from point of care	0		
	Dispensers are fully functioning		1	
	Total			**12/24**
II-Supplies for hand hygiene	Leaflet/liquid soap is available at hand wash sinks		1	
	Dispensers are appropriately cleaned & refilled when empty		1	
	Alcohol-based hand rub is available			2
	Single use towels are available at all hand washing sinks	0		
	Sterile towels are available at OR sinks		1	
	Appropriate receptacles are available for disposal of used towels		1	
	Patients are offered hand hygiene facilities		1	
	Total			**7/14**
III- Education & training	Regular educational sessions are organized on periodic basis		**1**	
	On job training is regularly performed		**1**	
	Promotional items on hand hygiene are distributed to health care providers	**0**		
	Reminders (Posters) promoting hand hygiene are available and displayed in areas visible to all		**1**	
	Written polices & procedures on hand hygiene are accessible to all staff			**2**
	Total			**5/10**
IV-Monitoring & Evaluation	Usage of Alcohol-based hand rub is measured		**1**	
	Direct observation audits of hand hygiene compliance are carried out on regular bases		**1**	
	There is a regular feedback of the audit results	**0**		
	Total			**2/6**

Appendix 4
Hand hygiene knowledge test for health-care workers

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

ANNEX 35

SITE ID:

Hand hygiene knowledge test for health-care workers

- The knowledge required for this test is specifically transmitted through the WHO hand hygiene training material and you may find the questions more difficult if you did not participate in this training.
- Tick **only one answer** to each question.
- Please read the questions carefully before answering. Your answers will be kept confidential.
- SHORT GLOSSARY:

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Handwashing: washing hands with plain or antimicrobial soap and water.

1. Personal ID: _____ 2. Date: _____
3. Hospital: _____ 4. Ward: _____
5. Service: _____ 6. City: _____
7. Country: _____
8. Nature of hospital: O Public O Private
9. Type of hospital: O General O Teaching O District O Acute care O Long-term care
10. Gender: O Female O Male
11. Age: _____ years
12. Profession*: O Nurse O Auxiliary nurse O Midwife O Medical doctor
O Technician O Therapist O Other

* **Students** must be included among nurse/midwife or medical doctor, according to the different professions
Technicians: radiologist, cardiology technician, operating room technician, laboratory technician
Therapist: physiotherapist, occupational therapist, audiologist, speech therapist
Others: dieticians, dentist, social worker

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HAND HYGIENE KNOWLEDGE TEST FOR HEALTH-CARE WORKERS

13. Department (please select one department which is closest to yours):

O Internal medicine	O Surgery	O Intensive care unit	O Mixed medical/surgical
O Emergency unit	O Obstetrics	O Paediatrics	O Long-term/rehabilitation
O Outpatient clinic	O Other		

14. Did you receive a formal training in hand hygiene? O Yes O No

15. Is an alcohol-based handrub readily available at your institution? O Yes O No

16. Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care setting? *(tick one answer only)*

a. O HCWs' hands when not clean
b. O Air circulating in the hospital
c. O Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)
d. O Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

17. What is the most frequent source of germs responsible for health care associated infections? *(tick one answer only)*

a. O Germs in the hospital's water system
b. O Germs in the hospital air
c. O Germs already present on or within the patient
d. O Germs in the hospital environment (surfaces)

18. What is the minimal time needed for alcohol-based handrub to kill most germs on your hands? *(tick one answer only)*

a. O 20 seconds
b. O 3 seconds
c. O 1 minute
d. O 10 seconds

19. Which of the following statements on the technique of hand hygiene with an alcohol-based handrub are "True"?

a. The handrub has to cover the entire surface of both hands	O True	O False
b. Hands have to be dry before care	O True	O False
c. You can dry your hands with a towel after handrubbing	O True	O False

20. Which of the following should be avoided as associated with a likelihood of hand colonisation?

a. Wearing jewellery	O Yes	O No
b. Damaged skin	O Yes	O No
c. Artificial fingernails	O Yes	O No
d. Regular use of a hand cream	O Yes	O No

21. Which type of hand hygiene method is required in the following situations?

a. Before writing in the patient record	O Rubbing	O Washing	O None
b. Before touching a patient	O Rubbing	O Washing	O None
c. When arriving on the ward after lunch	O Rubbing	O Washing	O None
d. Before giving an injection	O Rubbing	O Washing	O None
e. Before emptying a urinal	O Rubbing	O Washing	O None
f. Before opening a door to a patient room	O Rubbing	O Washing	O None

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HAND HYGIENE KNOWLEDGE TEST FOR HEALTH-CARE WORKERS

g.	After giving an injection	O Rubbing	O Washing	O None
h.	After emptying a bedpan	O Rubbing	O Washing	O None
i.	After removing protective gloves	O Rubbing	O Washing	O None
j.	When leaving the patient	O Rubbing	O Washing	O None
k.	After making a patient's bed	O Rubbing	O Washing	O None
l.	After visible exposure to blood	O Rubbing	O Washing	O None
m.	After touching a patient with diarrhoea	O Rubbing	O Washing	O None
n.	Before cleaning a bed after patient's departure	O Rubbing	O Washing	O None

22. Which of the following statements on alcohol-based handrub and handwashing with soap and water are true?

a.	Handrubbing is more rapid for hand cleansing than handwashing	O True	O False
b.	Handrubbing dries the skin more than handwashing	O True	O False
c.	Handrubbing is more effective against germs than handwashing	O True	O False

23. Which of the following hand hygiene actions prevents cross-transmission of germs to the patient?

a.	Hand hygiene before patient contact	O Yes	O No
b.	Hand hygiene after patient contact	O Yes	O No
c.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
d.	Hand hygiene after exposure to the immediate surroundings of a patient	O Yes	O No

24. Which of the following hand hygiene actions prevents infection of the patient by his or her own germs?

a.	Hand hygiene before patient contact	O Yes	O No
b.	Hand hygiene after patient contact	O Yes	O No
c.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
d.	Hand hygiene immediately before an aseptic procedure	O Yes	O No

25. Which of the following hand hygiene actions prevents infection of the health-care worker?

a.	Hand hygiene after patient contact	O Yes	O No
b.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
c.	Hand hygiene immediately before an aseptic procedure	O Yes	O No
d.	Hand hygiene after exposure to the immediate surroundings of a patient	O Yes	O No

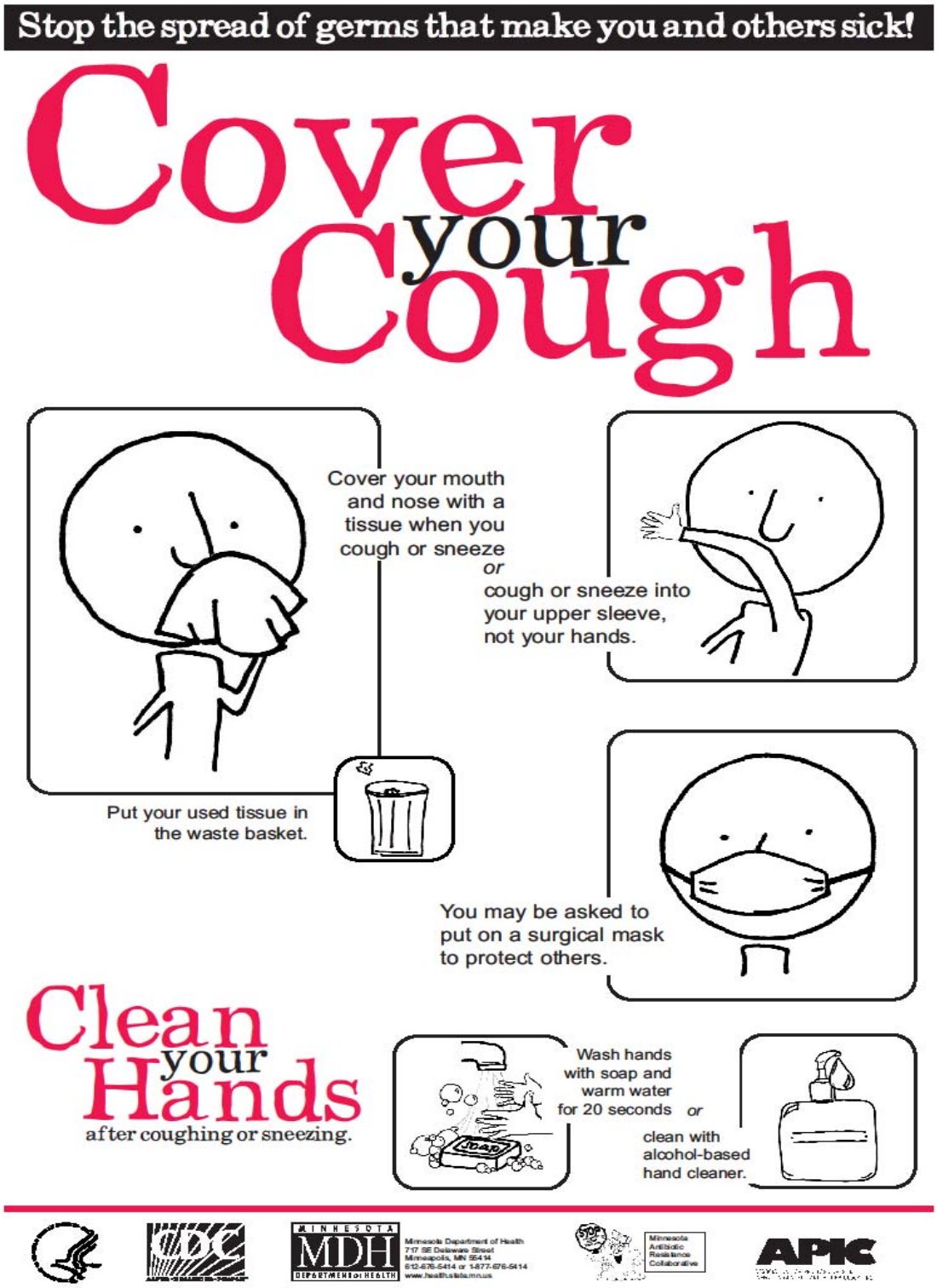
26. Which of the following surfaces can contaminate your hands with germs that you might transmit to patients if you do not clean your hands before touching him/her ?

a.	Door handle of the patient's room	O Yes	O No
b.	The same patient's bed linen	O Yes	O No
c.	Another patient's intact skin	O Yes	O No
d.	The same patient's intact skin	O Yes	O No
e.	Patient medical record	O Yes	O No
f.	The walls in a patient's room	O Yes	O No
g.	Another patient's bedside table	O Yes	O No

Thank you very much for your time !

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

HAND HYGIENE KNOWLEDGE TEST FOR HEALTH-CARE WORKERS


Stop the spread of germs that make you and others sick!
Cover your Cough
Cover your mouth and nose with a tissue when you cough or sneeze
or
cough or sneeze into your upper sleeve, not your hands.
Put your used tissue in the waste basket.
You may be asked to put on a surgical mask to protect others.
Clean your Hands
after coughing or sneezing.
Wash hands with soap and warm water for 20 seconds
or
clean with alcohol-based hand cleaner.
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APIC

Comparison of Corneal Thickness with Online Optical Coherence Pachymetry and Ultrasound Pachymeter

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Abstract: Purpose*:* To evaluate the accuracy of the intraoperative online optical coherence pachymetry (OCP) during LASIK surgery and assess its value during laser ablation. Setting: International Eye Hospital, Cairo, Egypt Methods: A prospective comparative study of 78 patients (156 eyes) with mild to moderate myopic/myopic astigmatic refractive error who underwent LASIK with Schwind Amaris Excimer Laser system equipped with optical coherence pachymetry (OCP). Preoperative, pre- and post- ablation stromal beds were measured with ultrasound pachymetry and optical coherence pachymetry. Only the Moria M2 microkeratome was used, and the flap thickness and actual ablation depth were calculated. Results: The preoperative measurements taken with the non-contact OCP were significantly lower than that with the contact ultrasound pachymeter, while there was a good correlation between them in the pre- ablation stromal bed and post- ablation stromal bed thicknesses. The calculated ablation depth by both techniques also matched the assumed maximum ablation depth calculated preoperatively with Schwind-CAM software.Conclusion: Intraoperative online optical coherence pachymetry may be considered a useful tool to assess the flap thickness and the residual stromal bed during LASIK surgery.
[Rany E. Mitwally, M. Tarek El-Naggar, FRCS, Mohamed A. Marzouk. **Comparison of Corneal Thickness with Online Optical Coherence Pachymetry and Ultrasound Pachymeter.** Life Science Journal. 2011;8(2):791-795] (ISSN:1097-8135). http://www.lifesciencesite.com.

Keywords: Pachymetry; Optical coherence; LASIK; Online.

1. Introduction

Corneal thickness is the major limiting factor in all tissue ablating corneal treatment procedures. Ablations deeper than planned may lead to over-corrections and inadequate residual corneal thickness which increases the risk of postoperative keratectasia **(1-4).** It is especially important in laser in situ keratomileusis (LASIK) as the flap may lead to mechanical instability of the cornea **(5).** Adding to the difficulty and unpredictability is the fact that the cut depth of conventional microkeratomes is variable for each individual patient, therefore it is almost impossible to reliably maintain a defined minimum of untreated cornea in each individual case **(6–9).** Therefore, intraoperative measurements of corneal thickness appear to be desirable for the safe assessment of corneal thickness during LASIK.

Until recently, there was no possibility to measure corneal thickness during refractive corneal surgery. This has changed with the integration of optical coherence tomography (OCT) into excimer laser systems. With this new device, very fine structures in the eye can be detected through an interferometric principle. The significant advantages of online pachymetry are the high resolution in micrometer range, no requirement of contact with the cornea and the continuous measurement of corneal thickness during the surgical procedure. **(10)**

Several instruments are available to measure the central corneal thickness (CCT) with varying degrees of accuracy. Ultrasound (US) pachymetry is commonly used because it is easy to use and relatively inexpensive, and has been considered the gold standard for CCT measurement. Disadvantages of US pachymetry include the need to anesthetize the cornea, cornea–probe contact, corneal indentation and the possible compression effect during measurement leading to corneal surface disturbance (which can interfere with other evaluations such as topography and wavefront acquisition). There is also the risk for corneal epithelial damage and transmission of infection. **(11)** In addition, measurements can vary as a result of probe misalignment or decentration, and the probe may not be perpendicularly aligned accurately positioned because of a lack of fixation and gaze control. Other disadvantages include the estimation of the thickness of a single point with each contact, and changes in the speed of sound in corneal tissues with different degrees of hydration**(12)** No correlation has been shown between compression and applied force.**(13-15)** Therefore the reproducibility of US pachymetry measurements is largely dependent on examiner experience; inter-examiner reproducibility is lower than intra-examiner repeatability, even when measurements are performed in normal corneas by expert examiners.

The purpose of this study was to evaluate the role of online optical coherence pachymetry in improving safety during LASIK procedures. The goals were to compare the results taken by acoustic and interferometric pachymetry, thus establish the

reliability and applicability of the online OCP device in routine clinical practice.

2. Patients and Methods

One hundred and fifty six eyes of 78 patients with mild to moderate myopic/myopic astigmatic refractive error were inducted to this study. All eyes had a best corrected distance visual acuity of 20/20. There were no age or sex restrictions.

Surgical Technique and Measurement

Preoperative US pachymetry was performed first. The device used was the Sonogage Corneo-Gage Plus, Sonogage Inc. The ultrasound velocity was set at 1640 m/sec. After topical anesthetic drops (proparacaine 0.5%) were instilled, the US probe was placed directly in the center of the eye, creating a 90-degree angle. The final US pachymetry value was obtained from 1 measurement by 1 technician. The US pachymetry device takes multiple, rapid, and sequential readings during a single applanation of the probe. This gives a mean US pachymetry reading with a standard deviation (SD). The reading was accepted when the SD was less than 2.0 to 3.0 mm.

The patients were prepared to undergo LASIK with Schwind Amaris Excimer Laser system equipped with optical coherence pachymetry (OCP). All the procedures were performed by one surgeon at the International Eye Hospital in Cairo, Egypt. Only patients having same-day bilateral LASIK using the Moria M2 microkeratome to create superiorly hinged flaps were included. The right eye was always treated first. The head size used was 130µ. The same suction ring and stop (following the Moria M2 nomogram), microkeratome blade head size (130 µm) were used in all eyes. However, to ensure consistency and avoid the variance in flap thickness when using the same blade for both eyes of each patient, each eye was treated with a new blade (i.e. first cut).

The online OCP was activated in all cases after insertion of the lid speculum and with first alignment of the eye with the excimer laser system. It was continuously active until the end of the procedure. The flap was always centered on the visual axis and opened immediately under the excimer laser microscope. At defined time points during the procedure, measurements by both the online OCP and followed by the US pachymeter were taken and recorded as follows: (1) with first alignment of the eye (preoperative); (2) after the flap was created and lifted; (3) at the end of ablation; (4) at the end of the procedure after the flap was repositioned. Flap thickness was defined as the difference between measurements 1 and 2. Residual stromal bed was defined as the difference between measurements 2 and 3.

3. Results

The results show that all the measurements taken by the US were higher than the OCP. The preoperative pachymetry measurements showed a mean difference of 26.4µ. The flap thickness was higher with US, with a mean difference of 20.0µ. The preablation pachymetry showed a mean difference of 10.1 microns, the actual ablation depth presented a mean difference of 0.35µ, and the postoperative pachymetry showed a mean difference of 9.6µ. The correlation coefficient between online OCP and U/S measurements was 0.92 (P<0.001); with a mean difference of 15.125 ± 6.9 µm.

The mean postoperative refraction was SE of -0.5 ± 0.18 D; range from 0 to 1.25 D.

None of the eyes needed intraoperative alteration of the planned ablation parameters; a 300 µm residual stromal bed limit was not exceeded in any of the cases.

Table 1: Corneal pachymetry measurements with US and OCP; preoperative, pre-ablation and post-ablation LASIK

All measurements in µm	U/S		OCP	
	Mean ± Standard Deviation	Range	Mean ± Standard Deviation	Range
Preoperative pachymetry	551.7 ± 32.3	500 to 599	525.3 ± 32.1	483 to 575
Planned flap thickness	160			
Actual flap thickness	135.9 ± 23.5	119 to 157	120.9 ± 23.7	92 to 138
Pre-ablation pachymetry	453.6 ± 46.2	383 to 518	443.5 ± 41.9	385 to 505
Planned ablation depth	65.4 19.5 (42 to 90)			
Actual ablation depth	65.6 ± 27.7	46 to 111	65.25 ± 21.1	43 to 94
Post-ablation pachymetry	388.6 ± 53	323 to 482	379.2 ± 54.4	322 to 480

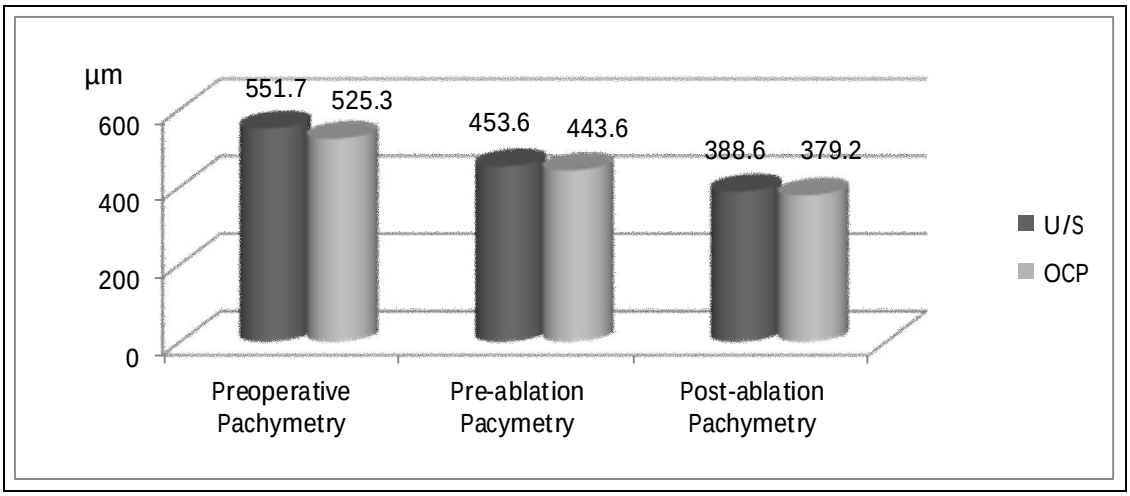

Figure 1: Mean of different measurements with U/S and OCP

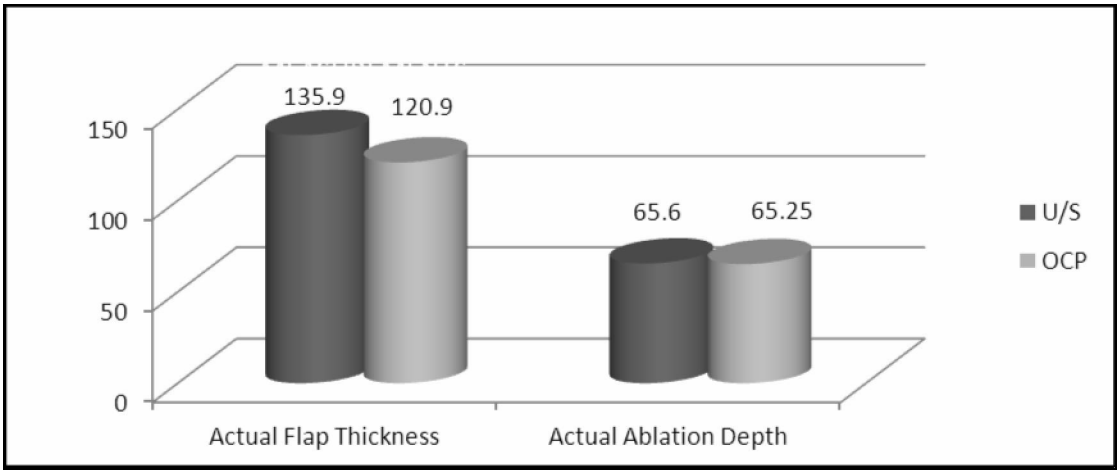

Figure 2: Mean of different measurements with U/S and OCP

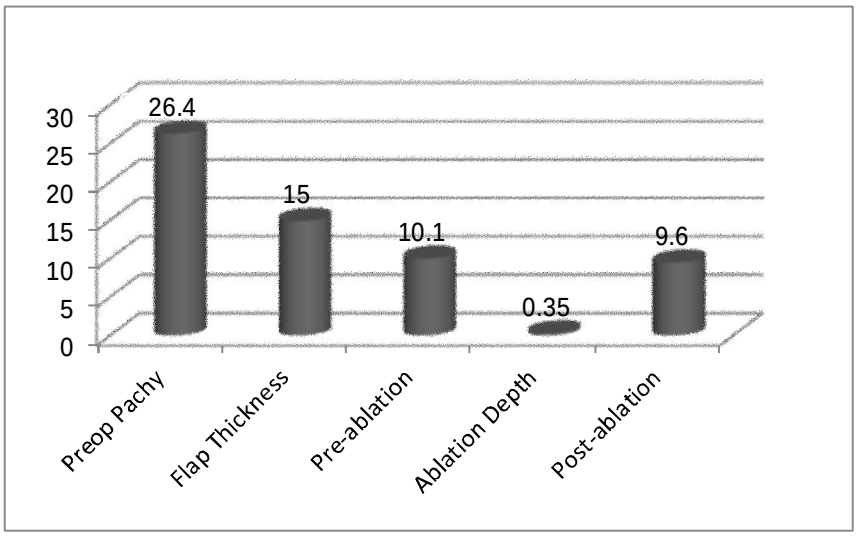

Figure 3: Mean difference between OCP and US measurements during the different stages of the procedure

4. Discussion

Accurate assessment of corneal thickness is important to minimize the risk for serious post-LASIK complications, such as keratectasia. Knowing the corneal thickness allows the surgeon to compute the depth of residual corneal tissue and determine the safety limit of a procedure. [16, 17] Given the amount of uncertainty in determining corneal thickness, considerably more tissue would have to be left unablated to ensure safety. This is especially important when treating eyes with higher myopic refractive errors with proportionally larger ablation depths, and during enhancement procedures. Furthermore, highly accurate corneal thickness measurements are critical in ensuring the accuracy and safety of enhancement procedures. [18,19] Although US pachymetry has been the standard for CCT measurement because of its established reliability, the high speed and noncontact approach of online optical coherence pachymetry make this method a promising alternative.

This study found that preoperative online OCP data (with the system-integrated 5% correction factor) were consistent with the ultrasound measurements. This is in accordance with the results in other studies, [20-25] which found slightly thicker corneal thickness measurements with the ultrasound than with slit lamp-mounted OCP or other intraoperative OCP measurements (without the use of a correction factor). Several reasons for this have been suggested; these include tilting of the ultrasound probe, averaging mode, and edema from local anesthesia [26] Since ultrasound is still considered the gold standard, this common denominator has been agreed on for practical purposes, as all different pachymetry techniques lead to slightly different results and it is up to now uncertain which device measures closest to the actual value. [27].

In our study, additional factors influencing the reliability of the pachymetry measurements must be considered. First, preoperative pachymetry measurements with ultrasound and online OCP were recorded after local anesthesia was applied.

Second, the measurement location of the online OCP was always on the visual axis, whereas the location of the ultrasound pachymetry was the center of the cornea. Despite these considerations, which are a problem in any study on this subject, both measuring techniques were consistent, including the gold standard (ie, ultrasound pachymetry).

Although several studies propose the use of ultrasound for intraoperative pachymetry, there are several limitations to this technology. These include the requirement of intraoperative contact with the stromal bed, possible incitement of inflammation, the problem of resolution and reproducibility of measurement, location, and the need for a certain amount of fluid in the tissue bed for proper coupling, which may interfere with laser ablation. [7,28,29]

The major drawback of online OCP in clinical use is that a fixed refractive optical group index of 1.3684 is used throughout the procedure. Experimental studies with corneas have shown that the optical index is different in the epithelium, Bowman membrane, and the anterior and posterior stroma. In addition, hydration changes in human and bovine corneas have been documented before and after LASIK. [5]

Online OCP is an excellent scientific tool, but further studies are needed to determine the implications of thinner central corneal thickness measured with online OCP as well as to resolve the systematic differences in measurements by these pachymetric technologies.

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5/21/2011

The deferral of investigation or prosecution in the ICC by request of the Security Council of UN organization

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Abstract: Pursuant to Article 16 of the ICC**,** The Security Council of UN may request a deferral of proceedings for a period of twelve months. It allows the Security Council to block a case from reaching the court. The power of the Security Council Makes some concerns to judicial Independence of the ICC, but this power is based on a number of conditions and limitations, both arising from the UN charter and the Statute of the ICC. This power of Security Council originated from the UN Charter that charge and compel the Security Council to maintain international peace and security.

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Keywords: ICC, Security Council, UN Organization, International Peace

1. Introduction

Pursuant to Article 16[1] of the statue, the Security Council may request a deferral of proceedings for a period of twelve months. The subjection regulates to defer investigation or prosecution. Such a request may be renewed under the same conditions by the Security Council. The request must be included in a resolution adopted under chapter VII of the United Nations charter. Pursuant to Article 39 of the charter, the Resolution must include a determination by the council of the existence of a threat to peace, breach of the peace or act of aggression. Thus, the request for deferral amounts to a measure that is outside of using armed force, pursuant to Article 41 of the charter.

The request for deferral found in Article 16 amounts to providing the Security Council with a veto power over the action of the ICC.[2] (Bergsmo, 1998)

While the Statute suggests that the Security Council's deferral be for 12 months, which runs from the date of the Resolution, The council may decide on a shorter period. Such a request may be renewed under the same conditions, as for the initial deferral. A Security Council's Resolution adopted under chapter VII of the united charter is required. This article contains no limitation on the number of times that a request for deferral may be renewed which implies that it could be indefinite. Hence, it allows the Security Council to block a case from reaching the court. However, a non renewal of a deferral request automatically allows the ICC to take up an investigation or prosecution where it was left off[3]. (Bourgon, 1998) It is important that the ICC to be born from the statute is made available to the Security Council acting under chapter VII of the UN chapter. Because council's powers for referral of a situation to ICC (Article 13 (b)) and deferral by virtue of Article 16, is subject to a number of conditions and limitations, both arising from the UN charter and the statute. So it is independence of the court in action, even the Security Council can not in any way modify those rules.[1] (Al Habib, Eshaq, 1999, Alaye, Mostafa, 1999)

It could be said that allowing such an Article in statute damages Independence principal of the Court in view of the orical and doubt about existence of the independence court.[3 2] But keep in mind that by attention to designed negotiations in Rome conference and sensitivity of delegations of some states to extra–ordinary roll of the security in the court , in fact , Article 16 to use of limitation on widespread powers of the Security Council is in better situation, because to the contrary using of the veto power that controversial is applicable by one state that is having such a power, deferral of

[1] - Article 16 : Deferral of investigation or prosecution
No investigation or prosecution may be commenced or proceeded with under this Statute for a period of 12 months after the Security Council , in a resolution adopted under chapter VII of the chapter of the United Nation , has requested the court to that effect , that request may be renewed by the Council under the same conditions.

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investigation or prosecution by virtue of Article 16 will need consensus of all nine permanent members of the council.

Anyway, this conversely extra,–ordinary Article as compared with the text that was included in first plan of statute that was regulated by International law commission is more advanced. By virtue of the first text, the court was prohibited from prosecuting any case that "the Security Council perceives it as threating against peace or breach of peace or act of aggression by virtue of chapter VII of the charter, unless the Security Council decides differntly.[3]

This regulation permits a state that is a member of the Security Council to prevent the prosecution, something that may be concealed by decision of the security itself and a decision of the Security may be blocked by using of the veto power by one of the five permanent member (united states of America, England, china, France and Russian Federation) in any time.[44]

The causation of drawing of this negotiation in the course of Rome conference was to set a connection between duty of the court for prosecution and trial of crimes included in Article 5 of statute and the duty of the Security Council to set reservation or restoration of peace and international security (Articles 39, 41 and 42 of charter). (Condorelli, Luigi) After abundant negotiation, in the end, to be dissolved by proposal state of Singapore based on giving permission for deferral of investigation and prosecution in one year period and the possibility of renewal.[1]

By approval of Article 16 in current situation, the Security Council's powers which are included in the original ILC Draft be limited considerably, because to use this power from the Security, it is necessary conditions and limitations as follows:

1- Issuing of resolution and request of deferral investigation or prosecution from the court.
2- Agreement of five permanent members with this resolution.
3- Temporal time limit of 12 months, while it is renewed under those conditions.
4- Comparing of resolution with Article 39 of United Nations Charter.[25]

These safeguards have attenuated some of the concerns expressed in Rome that the previous provisions considerably under mined the independence of the court by allowing for extensive control by a political organ. Yet as was clearly stated by several delegations on a number of occasions, the Statute itself cannot affect the powers of the council under the Charter. By virtue of the operation of Article 103 of the charter, the Council, were it to adopt a mandatory resolution under chapter could still bypass existing treaty mechanisms for the prosecution of individuals in the sense that Member states obligations under charter would have to prevail over those under the ICC were to conflict.[36]

It seems if we believe to prevent the Security Council from using veto power for preventing the proceeding of the court, we will see an amendment in The United organization. (Gowlland, Debbas Vera, 2001) While cannot ratify regulations of charter by statute and ratification of charter is tied to definition conditions that set in Article 108. this question Arise that does the court has the situation that proceed in from of possibility of sabotage measures by the Security Council which is aimed at international peace and security ?

Anticipation of this privilege for the Security Council, while any state or international institution has not this privilege, indicates the special place of the Security Council in international relations and needs special attention from of Rome conference members.[17]

The two principal questions in this essay are: 1- what are the conditions and limitation for the Security Council for applying deferral power of investigation or prosecution of a case in the ICC?

2- Can the ICC seek refuge of proceeding deferral by the security?

Hypothesis:

1- Under Article 16, the deferral by the Security Council should thus respect the conditions set up by the UN charter, but also deriving from the system of the ICC Statute. The conditions of the Security Council for applying, This power is inserted in Articles 24, 39, 41 and 42 of the UN Charter.

2- The ICC itself is the only authority for interpretation from the Article 16 that the court has the right to seek refuge the request of deferral by the Security Council.

2. Source and Condition of deferral power

The more important condition to use power of deferral by the Council is that when a case is proceeding in the court and the Security Council by virtue of Article 16 of statute and the charter of

3- The Report of the International Law Commission about act of 46th session, 2 may to 22 jullay 1994, A/49/10 document of UN, Article 23 (3).

4- Schebas , william A , an Introduction to the International Criminal court , translated to persion by Baqer Mirabasi and Hamid Alohveyi Nazari , 1384 , jungle publication , first published , Tehran , p . 88.

[2] - Gowlland, Debbas, Vera, the Relationship between the Security Council and international criminal court, WWW. Global Policy.Org / int / justice / icc / crisis / 2oo1 relationship htm – 25k, p. 3.

[3] - Ibid, p. 3.

[1] - khatami far , Abdolah , the Relationship between International Criminal Court and the Security Council with emphasis on darfur case of sudan , thesis for master , faculty of law of Azad university , central Tehran , 1385 , p . 42 – 43.

United Nations perceive continuation of proceeding in the court as threat or preach of international peace and security.

The power of deferral of investigation or prosecution that is negative topic and require issuing of a resolution by the Security Council , do not cause spoil in act of the court because possibility of issuing of this resolution which needs a consensus of decision of all permanent members of the Security Council is rarely and even it conceals with using veto power by one of permanent members of the Security and using of veto power in this conditions is benefit for the court Secondly , by removing conditions of issuing of deferrals resolution, remove obstacle for proceeding by the Court.[18] Under Article 16 , the source of the power by the security Council to defer proceedings before the court, clearly stems from chapter VII of the UN charter and is to be connected with its responsibility for the maintenance of international peace and security. (Ebrahimi, Sayed Nasroalah)The deferral by the Security Council should thus respect the conditions set up by the UV charter, but also those deriving from the system of the ICC statute. In this sense, the power of the Security Council should be interpreted restrictively, as absolutely exceptional in the relations between political organs and the jurisdictional function.[29]

Under Article 34 of charter "the security council may investigate any dispute, or any situation that might lead to international friction or give rise to a dispute, in order to determine whether the continuance of the dispute or situation is likely to endanger the maintenance of international peace and security." So it is possible that security receive continuance of preceding a case before the court to endanger international peace and security. Under Article 39 of charter, obtain existence of any threat against peace, breach of peace or aggression will be on the Security Council. In addition to that the Security can receive continuance of proceeding as breach or threat against peace; it is possible that causation of deferral of investigation or prosecution be that the Security finds the previous situation of threat or breach of peace which the court by that causation to proceed is concealed. it gives reasons for necessity of existence of this Article in the statute of ICC that is as recognition of original role of the Security council to maintain international peace and security and as well as for the sake of harmony between two state elements , existence of this Article in the Statue is necessary.[110]

It could be asked whether the resolution of deferral should be accompanied (or followed) by effective action by the Security Council to maintain or restore international peace and security. Though present in previous drafts and often placed at the core of the rationale of this provision, such a condition is not explicitly required by the final version of Article 16. It[s] deletion appears to be in accordance with the wide discretion that characterizes the exercise of the Security Councils powers under chapter VII: accordingly, the Security Council could consider that the deferral per se constitutes an appropriate and sufficient means to maintain international peace and security, it could also decide upon the adoption of further measures for this end. The only real condition for the Security Council appears to be the general obligation to give reasons for its decision in keeping with the purposes and principles of the UN charter and the objectives established under chapter VII.[211]

The Security Council's power to block the exercise of jurisdiction by the ICC is difficult to understand and some what paradoxical. While, on the one hand, it is argued that the ICC is being set up to try crimes of the gravest magnitude for the sake of humanity, on the other, it is argued that the maintenance of international peace and security might require that those alleged to have committed these crimes – be permitted to escape from justice if the Security council so decides. For this reason, the support of the Security Council would be difficult to justify in the eyes of the international community.

3. **Studding of Article 16 of the court statute**

The Security Council is called to intervene in the exercise of the ICCs jurisdiction in a, negative way. By virtue of Article 16, this UN organization is entitled to defer investigation or prosecutions before the court for a limited (though renewable) period of twelve months. This provision thus acknowledges the Security Councils primary responsibility for the maintenance of international peace and security, allowing it to coordinate – even in terms of time – the prosecution of international crimes with the other measures which it undertakes for the fulfillment of its mission.[112]

By virtue of Article 16, the deferral by the Security Council will have limited temporal effects: the stay in the proceedings should not exceed twelve months. This condition does not arise from the UN charter

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[1] -I abib , p . 43.

[2] - Condorelli , Luigi and Satiago Villalpando , Referral and Deferral by the Security Council , In the Rome statute of the International criminal court , op . cit , p . 646.

[1] - United Nations Department of public Information , Analysis of Issues in the Draft Statute , may 1998 , p . 4 . http : // www . un . org / icc / dstatate , htm.

[2] - Condorelli , Luigi , op . cit , p . 648.

[2] - Condorelli , Luigi , op . cit, p . 628.

and is rather directly imposed by the statute it self, limiting the interference of the Security Council with the judicial activity of the court. It dose not result in a restriction of the powers of the Security Council under chapter VII , since the renewal of the deferral is possible every twelve months, but it is subjects to certain conditions. In fact, the Security Council will have to vote and to be justified by reference to the persistence of a threat to the peace, breach of the peace, or act of aggression and to the fact that the deferral of the activity of the court constitutes an appropriate means to maintain or restore international peace and security. The mechanism thus encourages a renewed debate within the Security Council and creates accountability on the part of this UN body.[113]

It cannot ignore that ICC is regulated on the present world discipline and logically will operate on the basis of international accepted rule and influence of big powers. The Article 16 is the reason of creation of the situation and relationship between overruling rule and judicial proceeding of the court.[214] While political tendencies and probably tyrannical of the Security Council for the sake of third countries namely south countries is not hidden for any one , but in fact mentioned Article take a veto right to the Security Council and this matter will be crowbar to pressure the court in the future and it creates serious problem for the court in the way of criminal justice procese.[315] The demanded deferral by the Security Council might conform with the UN charter. In the first place under Article 39 of the UN charter, the Security Council should, as a preliminary step, determine the existence of a threat to the peace, breach of the peace, or act of aggression. This situation doss not need necessarily to find its direct case in the investigation or prosecution per se : the Security Council could refer to a larger factual or political back ground , related to the proceedings before the court and placed in one of the categories described in Article 39, on the contrary , the Security Council shall indeed justify its decision of deferral as a means to maintain or restore international peace and security : it should give reasons for its decision by demonstrating that the suspension of the investigation or the prosecutions will contribute to the objective provided for in the chapter VII of the charter.

It is also confirmed by the worlds of Article 16, which specifically refer to investigation or prosecution, before the court, as opposed to a general term such as proceedings.[1]

4. Issuing of resolution and announcing of that to the court

The first condition for applying of Article 16 for the Security Council and request of deferral of investigation or prosecution in the court is that as the case is proceeding in the court and a resolution is issued from the Security for deferral of investigation and or prosecution and is announced to the court. According to Article 27 of the United Nation charter, the resolution which is bearer of deferral of investigation or prosecution must be decided by positive vote[2] [16] of all nine permanent members. Consequently none of the Security Council members is not capable to prevent the court alone from continuance of investigation or prosecution in the definite case , because demand of deferral of investigation or prosecution must be decided by the Security Council members that is included all permanent members.[317] According to Article (2) 17 , relations agreement between the International Criminal Court and the United Nation organization "when the Security Council , in using of the chapter VII of UN charter, adopts a resolution and request from the court which by virtue of Article 16, no engage any investigation or prosecution or continue, the request immediately will transmit by the General Secretary to the president and the prosecutor. The court will announce reception of the request by the General Secretary, and in the case of need", so that will inform the Security Council, from the measures that adopt in this regard.

So, after issuing of resolution, it must be announced by the General Secretary of UN to the president of the International criminal Court for action.

The practical current of the Security Council shows that consensus of the permanent members of the Security Council about threat against peace, breach of peace or aet of aggression is difficult. This situation can conceive as hope full for independence of the court for prosecution of international criminals.

5. The Conformity of deferral with chapter VII of the charter

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[1-] Condorelli , Luigi , op . cit, pp . 648 - 649.

[2] - Alaye , mostafa , International Criminal court , Human Right and studing of matter of joining In the International Criminal Court and the Islamic Repulic of Iran , foreign state press , Tehran , 1378 , p . 412.

[3] - Ebrahimi , Sayed Nasroulah , the preface on establishment of International Criminal Court and studing of its Statute , In the International Criminal Court and Islamic Republic of Iran , op . cit , p . 386.

1- condorelli, op . cit, p . 647.

[2] - The impossible vote of permanent member, according to current policy, does not account applying of veto.

[3] - p.30. http : // www.un.org/ icc 4 – Declaration of the hague.

Article 16 of statute by expression "…in a resolution adopted under chapter VII of the charter of the United Nation, has directed the court to that effect (deferral of investigation or prosecution) compel the Security to rely on chapter VII of UN chapter for deferral. This means that the Security must obtain against peace, breach of peace or act of aggression according to Article 39 of the UN charter. This problem is possible that the court can study the conformity of action of the security. In the past, international courts dislikes severely from prediction of this role for the Security Council.[118] But in the place of the court, its statute, take this power (deferral of investigation or prosecution) to the Security Council. This is arised from the charter that the Security is the first responsible for reservation of international peace and security and the court is an independent institution outside from the UN organization. It is possible that in some instances, the court preceding is entered to the domain of international peace and security, so, it was necessary to make a relationship between two institutions.

The court should have been the power to review the Security Council decision for deferral, according to the competence de la competence. This is like to review by the past Yugoslavia International criminal court about legitimacy of the Security Council resolution in safeguarding of the independence in the case of tadic.[1]

6. The objections of the Article 16 of the statute

Some believe that the Article 16 is unacceptable logically, because it is caused the judicial function of the court to be tied to decision of a political organization while it should point out that this analogous power about priority of decision of political organ on function of judicial institution, this is not about function of ICJ and the Security Council. Because they owe organs of the UN and it subject to the charter.

The same preparatory works, comes into existence about conformity of the Security Council for reservation of international peace and security under Article 24 the UN charter.[219]

As it was felt, the Article 16 takes abuse only some day after that Rome statute put into force. It takes place at the time that as the commission the UN organization officials in the Bosniea and Herzgowina (UNMBH) came into effect. The untied states, which was largest participator in the commission in view of human and things sources, threats if nations of that country that apply as official or is applied in the past, for commission of any act that be commit negligent in relation to their commissions, were not immune from prosecution of the International Criminal Court, it will cut it's aids. The rest of the Security Council members consent to the Security Council demand and issue resolution 1422 dated 12 July 2002 and refer it Article 16, while this resolution is deviation from regulation of Article 16 of the statute and the UN charter.

Without doubt, the United States for Reaching to its goals, take play the UN and with means of UN payment of its debts for obtain its demands take pressure on it.[120]

In the mentioned case, United States by threat to veto of all commission of peace reservation official of the UN organization obtained its demand. While in the final, this resolution in 2004 disapproved. America , in the recent years , see Article 39 of charter for reservation of national benefits and its reaction to international premise have been conformity with its national benefits , Not reservation of international peace and security.

The Security Council can use Article 16 from two views in hand that continuance of investigation or prosecution of a situation in the court , threat international peace and security and on the other hand that the situation which was a threat to international peace and security is canceled. Of course, the second situation will be a bread interpretation from Article 16 that we may see the Security how will act in the future. Because according to this Article in the view of the security, continuance of proceeding in the court will be a threat to international peace and security, it has the right of deferral of proceeding and cease of the threating situation of international peace and security. Because duty of the court is prosecution and trial of international criminal any way and in the time that this premise is not a threat for international peace and security, the court has the right of proceeding and the security can not prevent it. Anyway, there is the principal criticism that how does fulfillment of international justice can receive threat to international peace and security. (Schebas, 2005) The Rwanda court give attention to this topic that halt of commit

[1] - pradel , jean , droit penal compare , paris : Dalloz , 1995 , p . 251.

1- - Seils, paul and Marieke Wierda , the international criminal court and conflict mediation , June 2005 , at: 9. www.ictj.org/images/content/1/1/119, p.

[2] - See VILC (1994) Vol. II, part 2, at 43 – 45, Report of the ad hoc committee (1995), supra note 28, at para. 124, Report of the preparatory committee (13 September 1996), supra note, para 141.

[1] - Saed , Edward , and now the Last day (1387) , In the last day of unruly states , Translated to farsi by masood khirkhah , philosophy publication Institution , first edition , p . 33.

of crimes in the Rwanda quarrels , is not necessary means restore international peace and security to this country "because until the time that the justice is not fulfill about criminals cannot claim that the peace and security completely settled again.[221]

For the same reason one can say that deferral of investigation or prosecution in the court, is not necessary means reservation or restore international peace and security and the Security cannot receive in any time only this affective measure include in the Article 41 of the as charter and maybe it is necessary that surplus deferral, resort to another measures for obtain this aim.

Another object of this Article, namely deferral of proceeding is related to guarantee of accused right. Since deferral is causes delay of proceeding for a long time whichever can continue for one year this delay is inconsistent with accused right for trial without undue delay. (Khatami far, 2006) In addition one can ask, does contamination of detention for deferral period about accused during in infinite time is in control of the court? So that we know according Article 58 of the statute, "at any time after the initiation of an investigation, the pre trial chamber shall, on applying the prosecutor, issue a warrant of arrest of the person if , having examined the application and the evidence or other information submitted by the prosecutor , it is satisfied that :

(a) There are reasonable grounds to believe that the person has committed a crime within the jurisdiction of the court.

(b) The arrest of the person would be necessary ؛

(i) To ensure that the persons appears at the trials ؛

(ii) To ensure that the person does not obstruct or endanger the investigation or the court proceedings , or

(iii) Where applicable, to prevent the person from continuing with the commission of that crime or a related crimes which is within the jurisdiction of the court and which arises out of the same circumstances …"

So according to above instances, deferral of investigation and prosecution as a whole and with prohibition of the prosecutor from doing any work is incompatibility of the criminal justice.

According to notes of 4, 5, 6 and 7 the mentioned Article the order of arrest while does not issue an order that be contrary with that, will be creditable and in the deferral time does not specify this situation in the statute that this subject is incompatible with accused right. In addition the prosecutor can de mind the amendment of arrest order for decrease or increase from pre trial of the court or demand to summon order of a person from pre trial chamber. If the pre trial chamber is satisfied that there is sufficient reasons …. Will issue summon? With deferral by the Security Council all of above mentioned are contrary with a fair Trial.

Surplus, for the Security Council, for issuing of deferral resolution, what is most priority is reservation of international peace and security, but it does not mean that obtaining this priority can ignore guarantees for a fair Trial. The court should attain that does the resolution is caused that accused stay in detention, in the under way and without trial or not? If it is so, the act of the Security Council is inconsistent with the charter, because it is deviance from the goals of chapter VII. Studying of existence of specified conditions in the chapter VII of UN charter and the statute of the court about demanded deferral by the security, is the sufficient judicial guarantee for the accused right.

The Security is bound to observance of the purported of the court statute, because by ratification the relation agreement inserted in Article 12 of the Statute, the obligation is enjoyed legal aspect. These two institutions by preamble and Article 2, recognize responsibility of each other and the UN organization recognize the court as independence permanent judicial institution that according to Article 1 and 4 of the statute has international legal personality and UN organization and the court are obliged reciprocally to respect each other situation and commission. So the Security Council cannot intentionally to the court commissions and focus only on international peace and security.

7. The procedure in case of deferral

Probably due to its turbulent history of drafting, Article 16 is a totally isolated provision in the procedural system of the ICC statute; it contains no regulation of the mechanisms to put the deferral into effect and no other article refers to it. Moreover, the Rules of procedure and Evidence have failed to confront and deal appropriately with this issue. In the absence of any adequate regulation, we will identify hereinafter the general principles that should guide the procedure before the court in case of deferral.

The request of deferral by the Security Council should be addressed to the president of the ICC, which has the responsibility for the proper administration of the court. By interpreting prima facie the resolution of the Security Council, the presidency shall identify those cases currently proceeding to which the deferral should apply and

[2] - Prosecutor V. Kanyabashi , case No . ICTR – 96 – 15 – T, ICTRT. ch , Decision on the Defense Motion on jurisdiction , para . 26.

communicate the request to the competent chambers. In any event, the presidency shall also notify the request to the prosecutor – as it is pertinent to the future conduct of his or her investigation. If applicable, the interested suspects or accused, should also be has informed. (Security Council, 2005) Although, under Article 16, the court appears to have no discretionary power in deciding whether to abide by the request of deferral , the decision by the Security Council is subject to such formal and substantial conditions as to require review by the jurisdictional organs, This the interests of justice and in order to safeguard the independence of the judiciary. (Prosecutor V.) Consequently, the decision to suspend current proceeding should pertain to: (a) the pre – Trial chamber – guarantor of the interests of justice in the investigation phase – if the prosecutor is examining the case, (b) the Trial chamber – that shall ensure a fair and expeditions trial as well as full respect of the rights of the accused – once the Trial has begun, or (c) the Appeals court, if the case is under appeal. In addition, since the prosecutor should exercise his or her functions in full respect of the statute, he or she shall abstain from initiating, or continuing with, investigation on the situation at stake. (Lione yee) To the contrary, since Article 16 refers only to "investigations" and "prosecutions", There for nothing prevents the prosecutor from continuing to gather information that would prove useful in future proceedings, once the deferral period has expired.[122]

Of course, the prosecutor also according to Article 19 (3) of the statute can demand judgment from the court about the subject of acceptance capability. So, the principal question is, can the ICC refuse the request of proceeding deferral by the security? Some believe that it does not appear, existence of the expression at the Article 16 of the Statute that say: "No investigation or prosecution may commenced or proceed after the security council … has requested the court …" invest with the prosecutor a power about commencing or proceeding of prosecution before the court after the request of the Security council rely on the chapter VII. (United Nations, 1998) But the important subject is that the court itself is the only authority for interpretation of the Article 16 As such the court has the right to deny the request of deferral by the Security council.[123]The ICC is not bound by the request of the security council (for deferral). Because be bounding may be receive as acceding from limit of Article 16 of the statute.[224]

8. Consequences of the Deferral

The main consequence of deferral is expressly provided for by Article 16: "no investigation or prosecution may commence or proceed." It stems from the broad language used by this provision that the deferral entails the suspension of any judicial proceeding before the court, from the investigations of the prosecutor to trials themselves (either in the first instance, in appeal or revision).

The deferral, however, should not mean the complete paralysis of the ICC with regard to the situation: the wording of Article 16 clearly refers, and limits its consequences exclusively, to the investigations and prosecutions before the court. The prosecutor should then be entitled to conduct those examinations that precede the actual initiation of the investigation following an authorization by a pre trial chamber[325]: he or she could, in particular, steps to analyze seriousness. Moreover, the administrative duties of the court linked with the deferred cases should be completed. It could be asked whether some exceptional judicial activities can still be pursued after the deferral. Councils burden to take the necessary measures to secure confidentiality in the interests of justice and to return the relevant documents at the end of the period of deferral. (YILc, 1994) A more initiate issue concerns the guarantee of the right of the accused, since the deferral will entail a delay in the proceeding for a long period. Doubts can be expressed as to the compatibility of the Security Council's request of deferral with the right of the accused to be tried without undue delay. (Seils, 2005) Moreover, it could be asked whether the continued detention for the period of deferral of those accused that were kept under custody of the court pending trial is not to be considered arbitrary.[1 26] (Stan, Karestan , 2002)

That should certainly be the case for those measures considered appropriate by the court for the protection of witnesses and victims, since it would be unacceptable for their safety and well being to be affected by the deferral of the Security Council. On the other hand, Article 56 of the Statute, as presently worded, does not allow the court to proceed in such cases where the prosecutor, though not actively investigating a case, finds himself or herself confronted with a unique opportunity to take testimony or a statement from a witness or to examine, collect or test evidence, which may not be

[1] - condorelli , Lugi and Santiago Villalpando , op . cit , p . 650.

[1]- Stan , Karesten (2002) , the exemption of the forces of the peace keeper of the non member states of the ICC statute from judicial jurisdiction of the ICC , the ambiguous of 1422 resolution of the security council (1384) , Translated to farsi log Sayed Hessomoldin Lesani , law magazine , No . 32, p. 253.

[2] - abid , p . 257.

[3] - Article 15 (1), (2) of the statute.

[1] - Condorelli, Luigi and Santiago Villalpando, op. Cit, pp. 651 – 652.

available subsequently for the purposes of a trial. The exercise of the power of deferral by the Security Council causes a number of further problems, related to the preservation of the interests of justice. They should be solved, appropriately in accordance with the judicial system established by the Statute as a whole and in respect of the function attributed to the Security Council under the UN charter. Hereinafter, we will limit ourselves to some examples of the complications that may arise as a consequence of a deferral and their possible solutions. (M. Bergsmo, 1998)

In case of deferral of proceedings before the court, the prosecutor will find himself or herself in possession of documentation related to a situation being dealt with by the Security Council under chapter VII. (Saed, Edward, 2008) The question then arises whether he or she has the obligation to deliver the information to the Security Council for a better evaluation of the situation, taking into account that it may reveal the identity of witness in danger or the contents of seated documents: confidentiality may then be essential for the continuation of the judicial proceedings after the period of deferral. The problem is not contemplated by the Statute. It should be duly considered in the Relationship Agreement between the court and the UN under Article 2: the agreement should, in particular, provide for the possible obligation for the prosecutor to cooperate with the Security Council, conversely, so shall the Security Council.

Conclusion

Deferral of investigation or prosecution by the Security Council rely on Article 16 of the statute acknowledges the Security Council's primary responsibility for the maintenance of international peace and security. The Security Council responsibility arises from Chapter VII of the UN chapter.

The ICC may prosecute crimes inside it jurisdiction is related to international peace and security.

Nevertheless, the provision was strongly criticized and concerning the possibility of a deferral, which amounts to providing the Security Council with a veto power as it relate to the courts activity, the strict conditions of application it is subject to, as a measure pursuant to Chapter VII of the United Nations Charter will make it very difficult to use. (Pradel, 1995) The Security Council showed that it has a broad interpretation of the Article 16 and the statute. Therefore the urgent necessity is amendment of Article 16 to restrain the Security Council from abusing its power.

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[10] P. 30. http: // www. un.org / icc 4 – Declaration of the hague.

[11] Pradel, jean , droit penal compare , paris : Dalloz , 1995.

[12] Prosecutor V. kanyabashi, case No. ICTR – 96 – 15 –T, ICTRT. ch, Decision on the Defence Motion on jurisdiction.

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[19] United Nations Department of public Information, Analysis of Issues in the Draft Statute, May 1998, p.4. http://WWW.UN.Org/icc/dstatate, htm.
[20] YILc (1994) Vol. II, part 2, at 43–45, Report of the ad hoc committee (1995) , supra note 2, Report of the preparatory committee (13 September 1996).

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Effect of Short Term Caloric Restriction on Ischemic Reperfused Hearts in Adult Rats Subjected to Stress

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Abstract: Caloric restriction extends life span and decrease tissue susceptibility to stress –induced injury so it was intriguing to investigate a possible cardioprotective effect of short term caloric restriction during stress on ischemic reperfusion injury of the heart. This study was conducted on 32 adult albino rats which were assigned to 3 groups; control group C (n=10), Stress group S (n= 11) subjected to immobilization stress, and caloric restriction/stress group CR/S (n= 11) comprised of rats subjected to 35% caloric restriction and subjected to immobilization stress. The study was conducted for one month; obtained results revealed that S rats had significant elevation in ST segment , significant prolongation in half relaxation time (HRT) and significant decrease in plasma adiponectin level as well as cardiac tissue nitrate content. CR/S rats exhibited significant decrease in final body weight, BMI, absolute liver and heart weights compared to C and S groups as well as significant elevation of ST segment compared to C group. Ischemic reperfusion study of CR/S rat hearts revealed better ischemic tolerance compared to S rats as evidenced by the significant elevation of peak developed tension (PT/100mg LV)at 10 and 20 minutes of reperfusion, significant shortening of time to peak tension (TPT) at 20,30 minutes of reperfusion and HRT at 10, 20, 30 minutes of reperfusion as well as significant increase of myocardial flow rate (MFR/100 mg LV) at 20, 30 minutes of reperfusion. Biochemical analysis revealed significant elevation of tissue nitrate and plasma adiponectin in CR/S compared to S rats. Histopathological examination of the hearts of S rats showed large areas of leucocytic infiltration, marked vacuolation, undergoing apoptosis with small deeply stained nuclei and widely dilated and engorged blood vessels indicating injury of myocardium. On the other hand hearts of CR/S rats revealed apparently normal cardiac muscle fibers with small area of leucocytic infiltration.
In conclusion, short term caloric restriction improved tolerance of the heart to global ischemic reperfusion injury in stress-subjected rats.
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Key words: caloric restriction, ischemic reperfusion injury, cardioprotection ,immobilization stress, tissue nitrate, adiponectin.

Introduction

Stress is defined as an adaptive physiological response to disruption in homeostatic mechanisms *(Zhao et al., 2007)*. Moderate stress load can provoke protection, though overload may contribute to heart disease, high cholesterol, and high blood pressure *(Zhao et al., 2007)*.

An important relationship between stress and the heart has been for centuries the subject of debate *(Khanna et al., 2006)*.The effect of stress on rhythm of heart, myocardial blood flow, and hypertension has been extensively investigated *(Sawai et al., 2007)*. The response of the cardiovascular system to stress has been attributed to increased catecholamine secretion and enhanced platelet aggregation and when exaggerated, these bad effects can contribute to the pathogenesis of ischemic heart disease *(Hjemdahl et al., 1991)*.Many epidemiological studies have linked chronic stressors such as social isolation, depression, and self-reported stress to increased morbidity and mortality from ischemic heart disease *(Ketterer ,1993*; *Tennant et al., 1994 and Krantz et al., 1996*).

Caloric restriction has been widely investigated to increase life span in several species ranging from yeast to mammals *(Nisoli et al., 2005)*, also it was reported to ameliorate cardiac effects of ischemic reperfusion in middle aged and aged rats *(Abete et al., 2002 and Long et al., 2002*).. Caloric restriction causes mild stress similar to the preconditioning, in which a mild stress enhances the tolerance of the organ to severe stress (Stein *et al.*, 2004).

The present study was planned to find out if short term caloric restriction in adult rats subjected to stress could alleviate cardiac ischemic reperfusion injury.

Materials and Methods

Experimental animals:

This study was carried out on 32 adult male albino rats weighing 160-200 gm at the start of the experiment. Rats were purchased from Ophthalmic Diseases Research Institute (Giza) and housed 3/cage in plastic cages and maintained in Physiology Department animal house, Faculty of Medicine, Ain Shams University under standard conditions of boarding, at room temperature. Regular meals were introduced daily at 8 a.m. Control rats were fed *ad libitum* water and the standard rat chow diet (AIN-93 M diet formulated for adult rodents) prepared according to the National Research Council (NRC) 1978 and Reeves *et al.,* (1993).This formula was analyzed in the National Nutrition Institute (NNI) according to Official Methods of Analysis of Aoac International 2003 and was found to provide 418.98 C/100 g diet.

Experimental protocol:

Rats included in the present study were 32 rats. All animals received standard rat chow ad libitum in the first 3 weeks to calculate average daily food intake, on the fourth week; rats were allocated into the following 3 groups:

Control group (n= 10): C rats fed ad libitum standard chow diet.

Stress group (n= 11): S rats fed ad libitum the standard chow diet and subjected to immobilization stress for 4 weeks.

Caloric restriction/stress group (n= 11): CR/S rats subjected to 35% caloric restriction and immobilization stress for 4 weeks.

Immobilization stress: rats were subjected to immobilization stress in the prone position at room temperature (20-24^{O}C), 1 hour/day, 6 days/week for 4 weeks in tight animal restraining cages (Curtin Mathesson Scientific, regular size) according to *Scheuer and Mifflin, (1998).*

***Caloric restriction regimen*:** 35% caloric restriction was carried out by serving CR/S rats 65% of the average daily ad libitum food intake calculated before onset of the study according to *Shinmura et al. (2005).*

Experimental procedures:

At the end of the experimental period, all rats were fasted overnight, weighed and injected intraperitoneally (i.p) with 1000 IU heparin sodium (Nile CO), half an hour later, the rats were anaesthetized with intraperitoneal thiopental sodium (40 mg/Kg). Height (from the tip of the nose to the anus) was measured to the anus to calculate body mass index (BMI) according to the following equation BMI= Body weight (Kg)/ length (m^2) *(Guyton & Hall 2006)*and ECG was recorded for each rat, a midline abdominal incision was made, then the abdominal aorta was exposed and blood samples were collected in plastic tubes, centrifuged at 4000 r.p.m. for 15 minutes for separation of plasma and were stored at – 80^{o}C for biochemical study after one week.

ECG recording:

Needle electrodes were placed beneath the skin of the 4 limbs of the animal near the paws, and connected through an ECG coupler to a 2 channel oscillograph (Cardimax FX 121, Fukuda Denshi Co, LTD). The electrocardiographic tracing was recorded from lead II with paper speed of 25 mm/sec, heart rate (HR), P-R interval, QRS duration, QT interval, Q wave voltage, R wave voltage and ST segment deviation were measured. The heart rate was calculated using the following equation:

$$HR = \frac{7500}{\text{Distance in mm between 6 successive peaks of R waves}}$$

Biochemical measurements:

a- Plasma adiponectin byAvibion Human adiponectin (Acrp30) ELISA Kit, according to the method described by *Kissebah et al. (2000).*

b-Tissue nitrate, according to the coloremetric method described by *Bories and Bories, (1995).*

Heart Perfusion:

Thoracic cavity was opened, the heart was excised and immediately placed in ice cold -modified Krebs-Henseleit bicarbonate buffer solution for fast cardioplegia, and the aorta was cannulated and a retrograde perfusion with Krebs-Henseleit bicarbonate buffer (pH: 7.4), gassed with 95% O_2 and 5% CO_2 as previously described by Langendorff technique modified by *Ayobe and Tarazi,(1983).* The tension developed by the heart was measured by a light weight (0-50 g.) range D1-isometric force transducer which is connected through a strain gauge coupler FC 117 to a two channel oscillograph (Washington MD2-Bioscience). One gram weight was attached to the heart apex and was left to hang freely. After 15 minutes stabilization, the baseline record was taken. Total global ischemia was induced by stopping delivery of the perfusion fluid for 30 minutes; afterwards the hearts were reperfused again for an additional 30 minutes.

Measurements:

Records of basal heart activities as well as responses to 30 minutes of reperfusion after 30 minutes of global ischemia were analyzed to calculate heart rate (HR, beats/min.), peak developed tension (PT, g/100 mg LV), time to peak tension (TPT, msec.), time to half relaxation (HRT, msec.), and myocardial flow rate (MFR, ml/100 mg/min.), were determined at 1,10,20,30 minutes of reperfusion.

Determination of cardiac weights:

Hearts were plotted by filter paper and weighed in 5 Digit-Melter balance (AK 163). Weights of the whole hearts and left ventricle and were expressed as absolute values in (mg), as well as relative values; absolute weight/ body weight ratio (mg/gm).

Histopathological examinations:

The hearts were kept in 10% formaline for histopathological examinations, dehydrated, cleared in zylol and embedded in parablast. Paraffin sections were cut serially at 6 μm thickness and stained by Hematoxylin and Eosin (Hx & E) as described by *Drury and Wallington, (1980)*.

Statistical Analysis (Armitage and Berry, 1987):

All statistical data and significance tests were performed by using SPSS (Statistical Program for Social Science) statistical package (SPSS Inc) version 8.0.1. Statistical significance was determined by one-way ANOVA (analysis of variance) for differences between means of different groups; further analysis was made by LSD (least significance difference) to find intergroupal differences; paired t test was performed to detect significance from baseline value in the same group. A probability of P< 0.05 was considered statistically significant.All results were expressed as mean ±SEM.

Results

ECG changes:

As shown in Table(1) and Fig.(1), CR/S rats exhibited significant *(P<0.05)* decrease in heart rate compared to stress rats. ST segment showed significant *(P<0.05)* elevations in S and CR/S- rats compared to control rats.

Changes in Body weight, body mass index (BMI), heart weight, heart weight/body weight ratio, left ventricular weight & left ventricular /body weight ratio:

As shown in table (2), CR/S rats demonstrated significant *(P<0.05)* decrease in final body weight, body mass index (BMI) and absolute weights of the heart and left ventricle compared to C and S rats. However, relative weights of the whole heart as well as the left ventricle were not significantly changed.

Changes in cardiac tissue nitrate:

As shown in table (3), S rats showed significant *(P<0.05)* decrease in cardiac tissue nitrate compared to C rats, while CR/S rats showed significant *(P<0.05)* increase in tissue nitrate compared to S rats.

Changes in plasma Adiponectin level:

As shown in table (3), S rats showed significant *(P<0.05)* decrease in plasma adiponectin level compared to C, while CR /S rats showed significant *(P<0.05)* increase compared to S rats.

Isolated Perfused Hearts:

I-Chronotropic activity:

Table (4) and Figure (2) revealed that baseline values of heart rate (HR) were comparable among the 3 studied groups. C rats exhibited no significant change in HR in the reperfusion period compared to basal value. S rats showed significant *(P<0.05)* slowing of HR at 1 minute of reperfusion compared to basal value. In CR /S rats significant *(P<0.05)* slowing of HR at 1 minute and significant *(P<0.05)* acceleration at 10 minutes of reperfusion were observed when compared to basal value. HR of CR/S rats was significantly *(P<0.05)* higher than S rats at 10 and 30 minutes of reperfusion.

II-Inotropic activity:

A-Peak developed tension (PT/100mg LV):

Table (5) and Figure (2) revealed that baseline values of PT/100mg LV were comparable among the 3 studied groups. C rats showed no significant change in PT/100mg LV in the reperfusion period compared to basal value. S rats exhibited significant *(P<0.05)* decrease in PT/100 mg LV at 10, 20 and 30 minutes of reperfusion compared to basal value, while CR /S rats exhibited significant *(P<0.05)* decrease in PT/100mg LV only at 20 and 30 minutes of reperfusion compared to basal value and maintained at significantly *(P<0.05)* higher values of PT/100mg LV at 1 minute compared to C group and at 10 and 20 minutes of reperfusion compared to S group.

B-Time to peak tension (TPT):

Table (6) and Figure (2) revealed that baseline values of TPT were comparable among the 3 studied groups. C rats showed no significant change in TPT in the reperfusion period compared to basal value. Both S & CR/S rat hearts exhibited significantly *(P<0.05)* prolonged TPT after 1 minute

of reperfusion compared to basal values. However, TPT of CR/S rat hearts was significantly *(P<0.05)* shorter than S rats at 20 and 30 minutes of reperfusion.

C-Half relaxation time (HRT):

Table (7) and Figure(2) revealed that baseline values of HRT were comparable among the 3 studied groups. C rats showed no significant change in HRT in the reperfusion period compared to basal value. HRT of S rat hearts was significantly*(P<0.05)* more prolonged at 1 and 30 minutes of reperfusion compared to their basal value and at 20 minutes compared to C rats. CR/S rat hearts exhibited significant *(P<0.05)* prolongation in HRT only at 1 minute of reperfusion compared to basal value and significantly *(P<0.05)* shorter HRT at 10, 20 and 30 minutes of reperfusion compared to S rats.

D-Myocardial flow rate (MFR/100mg LV /min.):

Table (8) revealed that baseline values of MFR/ 100 mg LV/min. were comparable among the 3 studied groups. Isolated hearts of C, S, and CR/S rats showed significant *(P<0.05)* decreases in MFR/LV at 10, 20 and 30 minutes of reperfusion compared to their basal values. However, CR/S rats maintained significantly *(P<0.05)* higher MFR/100 mg LV/min. values at 20 and 30 minutes of reperfusion compared to S rats.

Histopathological examination:

C rats hearts had normal cardiac myocytes (Figure, 3). Meanwhile, hearts of S rats had large areas of leucocytic infiltration marked vacuolation, undergoing apoptosis with small deeply stained nuclei and widely dilated and engorged blood vessels indicating injury of myocardium (Figure 4). On the other hand hearts of CR/S rats revealed only apparent decrease in diameter of cardiac muscle fibers, with small area of leucocytic infiltration (Figure 5).

Figure (1): ECG records (lead II) of control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats showing significant bradycardia in CR/S rats and significant ST segment elevation in S & CR/S rats.

Table (1): Changes in ECG parameters; heart rate (HR, beats/min), P-R interval (msec.), QRS wave (msec.), QT (msec.), Q wave (μv), R wave (μv), and ST segment elevation (μv) in control (C), stress(S) and caloric restriction /stress rats (CR/S) rats (M±SEM).

Groups	HR (beat/min.)	PR (msec.)	QRS (msec.)	QT (msec.)	Q (μv)	R (μv)	ST (μv)
C (10)	404 ± 23	44 ± 2.7	23 ± 1.5	70 ± 4.5	60 ± 6.7	640 ± 47.7	65 ± 7.6
S (11)	438 ± 14	47.3 ± 3.0	21.8 ± 1.2	63.6 ± 4.5	54.5 ± 4.5	681 ± 37.7	119 ±15.7*
CR/S (11)	384± 15**	43.6 ± 2.1	21.8± 1.2	65.5 ± 2.8	47.5 ± 2.8	727 ± 46.9	105±10.6*
P	NS	NS	NS	NS	NS	NS	< 0.05

*: Significance by LSD at P< 0.05 from control group.
**: Significance by LSD at P< 0.05 from stress group
P: Significance by one way ANOVA among the three studied groups
NS: not significant. In parenthesis is the number of rats

Table (2): Changes in body weight (BW, g), body mass index (BMI, Kg/m^2), heart weight (HW, g), heart weight/ body weight (HW/BW, mg/g), left ventricular weight (LV, g), left ventricular/ body weight (LV/BW, mg/g) in control (C), stress(S) and caloric restriction stress rats (CR/S) rats(M±SEM).

Groups	BW (gm)	BMI (Kg/m2)	HW (gm)	HW/BW (mg/gm)	LV (gm)	LV/BW (mg/gm)
C (10)	216 ± 4.8	5.1 ± 0.05	0.75 ± 0.02	3.5 ± 0.1	0.40 ± 0.01	1.85 ± 0.06
S (11)	209.8 ± 2.5	5.2 ± 0.2	0.75 ± 0.02	3.6 ± 0.08	0.39 ± 0.01	1.87 ± 0.06
CR/S (11)	162.3 ± 6.0*, **	4.1 ± 0.1*, **	0.60 ± 0.009*,**	3.7 ± 0.13	0.31 ± 0.01*,**	1.97 ± 0.09
P	< 0.001	< 0.001	< 0.001	NS	< 0.001	NS

*: Significance by LSD at P< 0.05 from control group.
**: Significance by LSD at P< 0.05 from stress group
P: Significance by one way ANOVA among the three studied groups
NS: not significant. In parenthesis is the number of rats

Table (3). Changes in tissue nitrate level (umollgm) and plasma adiponectin (ng/ml)in control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats (M±SEM).

	Tissue nitrate (umollgm)	**Plasma adiponectin** (ng/ml)
C (10)	0.42±.037	2.7±0.12
S (11)	0.21±.019*	2.2±0.09*
CR/S(11)	0.40±.026**	2.9±0.16**
P	<0.001	<0.05

*: Significance by LSD at P< 0.05 from control group.
**: Significance by LSD at P< 0.05 from stress group
P: Significance by one way ANOVA among the three studied groups
NS: not significant. In parenthesis is the number of rats

Table (4): Preischemic (basal) and postischemic heart rate (HR, beats/min.) of hearts isolated from control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats(M±SEM).

	Basal	**Postischemic reperfusion responses**			
		1 min.	10 min.	20 min.	30 min.
C (10)	164 ± 8.9	160 ± 12.8	187 ± 13.2	170 ± 15.7	170 ± 15.3
S (11)	155 ± 10.1	130 ± 12.8***	172 ± 13.7	160 ± 14.7	136 ± 14.3
CR /S (11)	163 ± 11.2	139 ± 12.8***	219 ±13.4**,***	190 ± 10.1	186 ± 14.4**
P	NS	N.S.	< 0.05	N.S.	NS

*: Significance by LSD at P<0.05 from the control group.
**: Significance by LSD at P<0.05 from the stress group.
***: Significance at 1, 10, 20, 30 minutes of reperfusion relative to baseline values
P: Significance by one way ANOVA among the three studied groups
NS: not significant In parenthesis is the number of rats

Table (5): Preischemic (basal) and postischemic values of peak developed tension (PT ,g/100mg LV) of the hearts isolated from control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats(M±SEM).

	Basal	Postischemic reperfusion responses			
		1 min.	10 min.	20 min.	30 min.
C (10)	3.29 ± 0.16	3.1± 0.14	3.2 ± 0.17	3.2 ± 0.15	3.2 ± 0.16
S (11)	3.40 ± 0.10	3.3 ± 0.09	3.1 ± 0.09***	3.0 ± 0.09***	3.01 ± 0.11***
CR/S (11)	3.64 ± 0.13	3.5± 0.13*	3.6 ± 0.15**	3.5 ± 0.14**,***	3.4 ± 0.13***
P	NS	<0.05	NS	< 0.05	NS

*: Significance by LSD at P< 0.05 from the control group.
**: Significance by LSD at P< 0.05 from the stress group.
***: Significance at 1, 10, 20, 30 minutes of reperfusion relative to baseline values
P: Significance by one way ANOVA among the three studied groups
NS: not significant In parenthesis is the number of rats

Table (6): Preischemic (basal) and postischemic time to peak tension (TPT, msec.) of the hearts isolated from control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats(M±SEM).

	Basal	Postischemic reperfusion responses			
		1 min.	10 min.	20 min.	30 min.
C(10)	158 ± 13.2	152 ± 7.9	138 ± 8.3	133 ± 7.9	148 ± 5.5
S (11)	135 ± 12.5	168 ± 10.7***	145 ± 9.3	156 ± 11.7	166 ± 13.7
CR/S (11)	141 ± 5.9	177 ± 14.6***	124 ± 7.7	126 ± 9.0**	127 ± 9.2**
P	NS	N.S.	NS	NS	< 0.05

*: Significance by LSD at P< 0.05 from the control group.
**: Significance by LSD at P< 0.05 from the stress group.
***: Significance at 1, 10, 20, 30 minutes of reperfusion relative to baseline values
P: Significance by one way ANOVA among the three studied groups
NS: not significant In parenthesis is the number of rats

Table (7): Preischemic (basal) and postischemic half relaxation time (HRT, msec.) of hearts isolated from control (C), stress(S) and caloric restriction/ stress rats (CR/S) rats(M±SEM).

	Basal	Postischemic reperfusion responses			
		1 min.	10 min.	20 min.	30 min.
C(10)	40 ± 3.7	42 ± 6.8	40 ± 5.4	36 ± 4.3	38 ± 4.9
S (11)	35.5 ± 5.2	52 ± 6.7***	51 ± 7.1	55 ± 8.0*	51 ± 6.7***
CR/S (11)	36.4 ± 5.1	55 ± 5.9***	24 ± 4.3**	25 ± 3.9**	31 ± 3.8**
P	NS	N.S.	< 0.05	< 0.05	< 0.05

*: Significance by LSD at P< 0.05 from the control group.
**: Significance by LSD at P< 0.05 from the stress group.
***: Significance at 1, 10, 20, 30 minutes of reperfusion relative to baseline values
P:Significance by one way ANOVA among the three studied groups
NS : not significant In parenthesis is the number of rats

Table (8): Preischemic (basal) and postischemic myocardial flow rate (MFR, ml/100mg LV/min.)of hearts isolated from control (C), stress(S) and caloric restriction stress rats (CR/S) rats(M±SEM).

	Basal	Postischemic reperfusion responses			
		1 min.	10 min.	20 min.	30 min.
C (10)	2.42 ± 0.09	2.18 ± 0.13	2.13 ± 0.15***	1.95 ± 0.15***	1.8± 0.11***
S (11)	2.32± 0.14	2.07 ± 0.21	1.8 ± 0.19***	1.5 ± 0.16***	1.47 ± 0.14***
CR/S(11)	2.40 ± 0.12	2.28 ± 0.16	2.07 ± 0.11***	1.98 ± 0.12**,***	1.88 ± 0.10**,***
P	NS	N.S.	NS	NS	<0.05

*: Significance by LSD at P< 0.05 from the control group.
**: Significance by LSD at P< 0.05 from the stress group.
***: Significance at 1, 10, 20, 30 minutes of reperfusion relative to baseline values
P:Significance by one way ANOVA among the three studied groups
NS : not significant In parenthesis is the number of rats

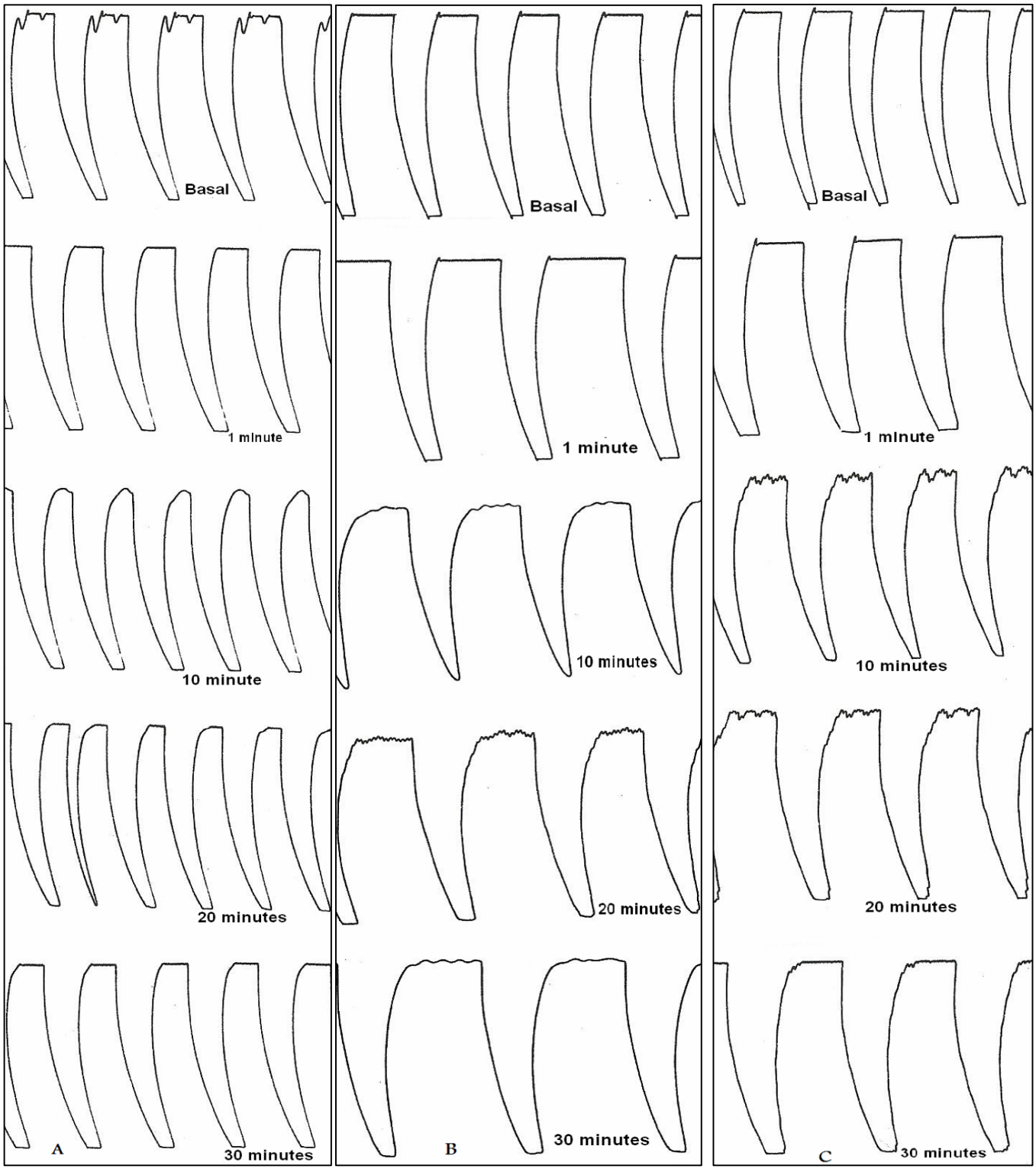

Figure (2);In vitro recording of isolated perfused hearts of C group(panel A),S group (panel B) and CR/S group (panel C) showing basal activity as well as after global ischemia and at1,10,20 ,30 minutes after reperfusion.

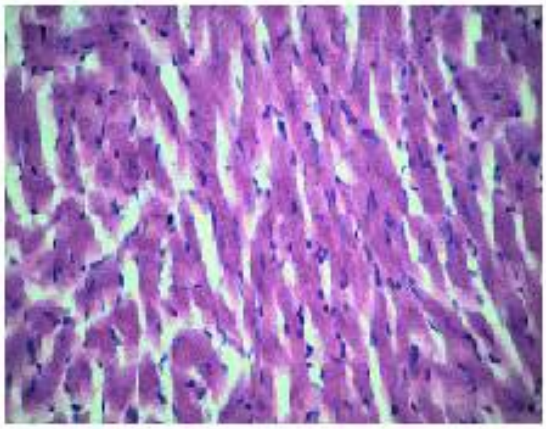

Figure (3). H&E stained histological heart sections of C rats revealing normal cardiac muscle fiber (magnification: 250x).

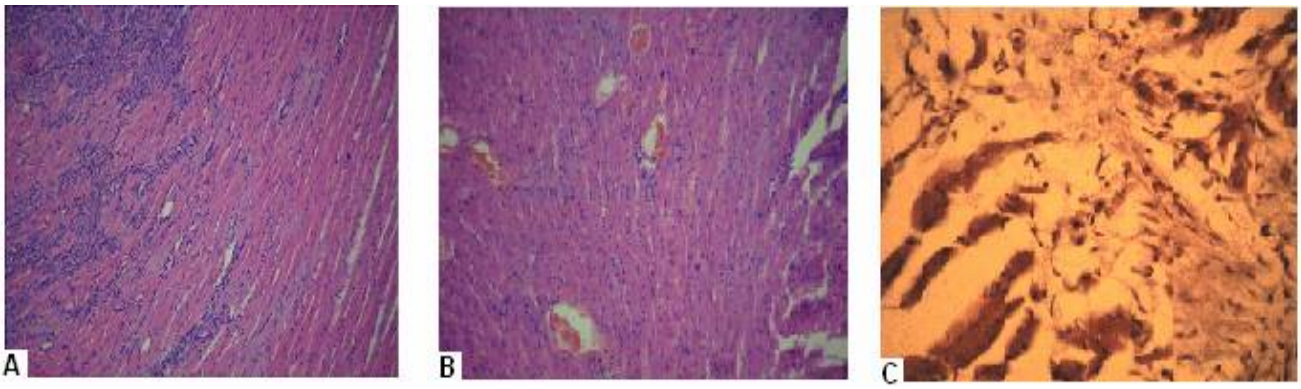

Figure (4). H&E stained histological heart sections of S rats revealing large areas of leukocyte infiltration(A), marked vacuolation ,undergoing apoptosis with small deeply stained nuclei and widely dilated and engorged blood vessels(B& C), indicating severe injury of myocardium (magnification: A & B250x & C- 640x).

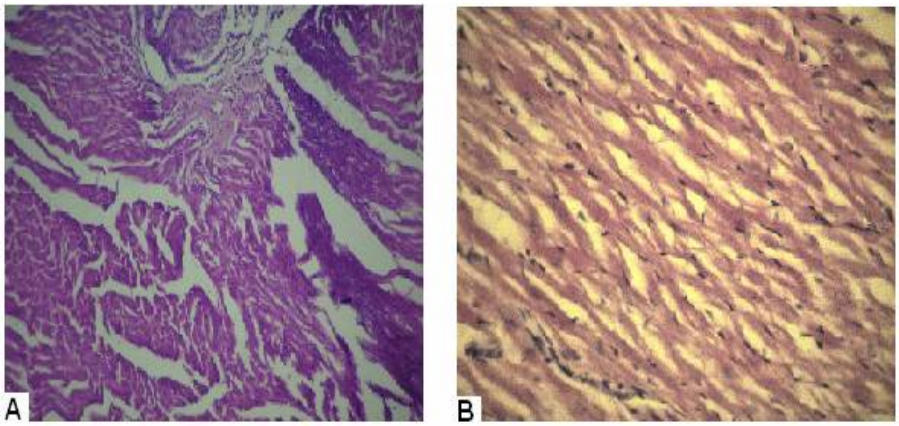

Figure (5): H&E stained histological heart sections of CR/S rats revealing an almost normal cardiac muscle fiber with small area of leukocyte infiltration (magnification: A 250x & B- 640x).

4. Discussion

Exposure to stress (.e.g. pain, inflammation and emotional stress) is inevitable in the course of life of any individual. Chronic stress in humans had been correlated with increased risk for ischemic heart disease *(Scheuer et al., 1998)* and those with ischemic heart disease are at higher risk to morbidity and mortality on exposure to stress *(Schwartz et al., 2010)*, so it was of value to look for a cardioprotective approach for stressed patients who might have a concurrent ischemic cardiac insult. Immobilization stress employed in the present study was estimated to be of mild intensity due to lack of significant change in heart rate, absolute and relative cardiac weights of S rats compared to unstressed controls. S rat hearts showed ischemic changes as evidenced by the significant elevation of ST segment. Moreover, myocardial flow rate at 30 minutes of reperfusion in S rats showed the lowest value compared to basal value indicating an exaggerated vasoconstrictor response of their coronary blood vessels to reperfusion injury. The significant decrease in cardiac tissue nitrate in S rats to 50% of control value might have contributed to these ischemic changes. It could be suggested that the physiological decrease in NO synthesis by coronary vascular endothelium in response to decreased shear stress *(Lam et al., 2006)* might have contributed to coronary vasoconstriction and decreased coronary blood flow during reperfusion period and that this decrease in NO production was more aggravated in S rat hearts leading to substantial decrease in myocardial flow rate even when reperfusion of the heart was resumed. Persistence of ST segment elevation in CR/S rats despite the significant bradycardia indicates that stress induced –cardiac risk was not completely abolished by short term caloric restriction. The significant bradycardia observed in CR/S compared to S rats disappeared during the *in vitro* study of isolated hearts of CR/S rats indicating that the underlying mechanism was either neural or humoral. Caloric restriction was reported to improve sympathetic /parasympathetic nervous system balance in favor of parasympathetic nervous system which would enhance cardioprotection *(de Jong et al., 2010).*

Isolated perfused heart study revealed that ischemic reperfusion induced evident decline of cardiac performance in S and CR/S rats compared to basal recordings which was consistent with the findings of *Flaherty and Weisfeldt, (1988)* and *Valen et al. (1993).* CR/S rat hearts showed significant increase in heart rate after 10 minutes of reperfusion compared to S rats which might reflect increased Na^+ and Ca^{++} ion influx in pace maker tissue leading to enhanced automaticity and inotropy which might have contributed to maintenance of PT/100mg LV in the first 10 minutes of reperfusion. The coincident significant shortening of HRT in CR/S compared to S rats reflects better ability of cardiac myocytes to decrease intracellular Ca^{++} concentration by Ca^{++} ATP_{ase} and Na^+ /Ca^{++} exchanger which might be due to better energy handling by cardiac myocytes. This improvement was shown to persist till 30 minutes of reperfusion indicating that caloric restriction had triggered adaptive mechanisms possibly involving coronary blood vessels as evidenced by the less deterioration of MFR/100mg LV compared to S rats leading eventually to alleviation of ischemic reperfusion injury and better cardiaoprotection.

Various mechanisms were proposed to explain ischemic reperfusion injury like increased cytosolic Ca^{++} due to Ca^{++} release from mitochondria, sarcoplasmic reticulum and nuclear organelles *(Boys et al., 2010)*, altered function of Na^+/ Ca^{++} exchanger *(Toth et al., 2009)*, endothelial injury and endogenous endothelin-1 release*(Han et al., 1995)*, burst of reactive oxygen species and mitogen activated protein kinase (MAPK)- mediated Na^+/H^+ exchanger phosphorylation and reactivation *(Garciarena et al., 2011).* Exposure to stress was reported to aggravate ischemic reperfusion injury by various mediators like immediate early genes (IEG), calcium leakage via ryanodine receptor 2, and catecholamine induced increase in free radicals *(Uevama et al., 2003 and Wittsteinet al,. 2005).*

Histopathological examination showed that hearts of S rats had inflammatory changes in the form of leukocyte infiltration, vascular congestion, apoptosis and myocyte injury which were in agreement with the findings of *Zhao et al. (2007)*.A possible role of inflammatory mediators and lymphokines in increasing susceptibility of S rat hearts to ischemic reperfusion injury cannot be excluded. *Cao et al. (2003)* found that coexistence of IL-2 during anoxia aggravates the effect of reoxygenation on the cell contraction and calcium homeostasis in the isolated rat ventricular myocytes, in which the mitochondrial lipid peroxidation induced by IL-2 was involved. *Lochner et al. (2009)* suggested that injury by necrosis and apoptosis share activation of p38MAPK as a common signal transduction pathway of ischemic reperfusion injury. Restoration of almost normal cardiac structure and amelioration of leukocyte infiltration by short term caloric restriction and consequently reduction of oxidative stress and apoptosis provide plausible explanation for improvement of systolic and diastolic functions after global ischemia and reperfusion in CR/S rats, a finding previously reported by *Sinclair (2005).*

The restoration of normal levels of plasma adiponecctin and cardiac nitrate levels with caloric restriction during stress came in accordance with the study of Zhu *et al.* (2004) and could be implicated in cardioprotection. Adiponectin- a circulating adipocyte –derived hormone was found to exert cardioprotection via its insulin sensitizing effect as well as antiatherogenic properties *(Han et al., 2007)*. It was reported that adiponectin improved recovery of left ventricular function after ischemia/reperfusion and limited infarct size in mice via increasing the phosphorylated form of AMP-activated protein kinase and acetyl-CoA carboxylase *(Shimura et al., 2007)* in addition to its ability to suppress inflammation ,apoptosis and oxidative stress (*Kondo et al., 2010)*. In a recent study by *Wang et al. (2010)*, biologically active adiponectin was found to be secreted by cardiac myocytes to exert protection against ischemic reperfusion injury by autocrine and paracrine fashion on adiponectin receptors (APN_1). We may suggest that short term caloric restriction adopted in the present study might have enhanced adiponectin expression in cardiac myocytes by a mechanism that needs to be resolved.

Absence of significant changes in absolute and relative cardiac weights as well as heart rate in S rats reflects unchanged arterial blood pressure. This was in accordance with the findings of *Puzserova et al. (2010)* who reported that 4 weeks mild stress had no effect on arterial blood pressure, heart rate and relative left ventricular mass due to elevated NO production by vascular endothelium in an important way of adaptation for prevention of normotensive rats from development of stress induced-hypertention. However, in our study, cardiac tissue nitrate level in S rats was found to be 50% decreased than control values which indicates considerable decrease in NO synthesis *(Lundberg et al.,2008)*. It could be suggested that although short term mild stress might have triggered an adaptational increase in vascular NO production, yet it exerted an opposite unfavorable effect on cardiac NO synthesis leaving the heart more susceptible to ischemic reperfusion injury. The underlying mechanism of stress-induced cardiac NO deficiency in S rats is difficult to speculate but it could be due to stress –induced oxidative stress which was reported by *Nishio et al. (2007)* to occur as early as 7 days of social isolation stress in mice. Oxidative state results in uncoupling of endothelial nitric oxide synthase (eNOS) resulting in production of superoxide by the eNOS monomer whereas the dimer, in the absence of oxidative stress produces mainly NO *(Landmesser et al., 2003)*. It was of interest to observe that absolute weights of the whole heart and left ventricle were significantly decreased in CR/S rats compared not only to S but also to C rats which might indicate considerable decrease in arterial blood pressure which together with the significant decrease in heart rate *in vivo* would decrease myocardial oxygen consumption. The observed increase in cardiac tissue nitrate level in CR/S than S rats could be expected to improve coronary blood flow in these rat hearts although the ST segment deviation was not completely abolished. Thus, it was not unexpected to observe that CR/S rat hearts could maintain a higher PT/100mgLV, MFR/100mgLV and shorter HRT during the reperfusion period compared to their stressed counterparts. NO homeostasis in the heart is determined by the cross talk between neuronal/endothelial nitric oxide (NO) synthase (n/eNOS) ,inducible nitric oxide synthase (iNOS) as well as the non enzymatic NO production by nitrite and nitrate which may end by either beneficial or toxic effects *(Lundberg et al.,2008 and Darra et al.,2010)*. However, it is generally accepted that increased nitric oxide production exerts vasculoprotective and cardioprotective effects *(Darra et al., 2010)*. Short term caloric restriction in stressed rats returned cardiac nitrate level to normal values which contributed to better tolerance to ischemic/reperfusion injury as recently confirmed by *Shinmura (2011)*. Little information is known about myocardial expression of silent information regulator 1 ($SIRT_1$) but several studies have indicated that $SIRT_1$ activates NOS and induces eNOS protein in endothelial cells *(Mattagajasingh et al., 2007 and Ota et al., 2007)*. *Mattagojasingh et al. (2007)* also reported that $SIRT_1$ and eNOS co-localize in endothelial cells and that $SIRT_1$ deacetylates eNOS, and thus increases endothelial NO. $SIRT_1$ is distributed in all mammalian tissues and evidence suggests that $SIRT_1$ regulates energy metabolism, endocrinal signals and some stress responses *(Bordone and Guarente, 2005)*. Animals and humans subjected to caloric restriction have high levels of $SIRT_1$ protein in brain, kidneys, muscles and liver *(Cohen et al., 2004)*, thus increasing the resistance of cells to apoptosis. Moreover, *Alcendor et al. (2007)* reported overexpression of $SIRT_1$ in starved animals which prevented apoptosis in cardiac myocytes.

In conclusion, this study demonstrated that short term mild stress decreased cardiac tissue nitrate with increased cardiac vulnerability to ischemic reperfusion injury. Nutritional approach by short term mild caloric restriction improve cardiac structural and functional abnormalities induced by stress. Improved cardiac tolerance to ischemic reperfusion injury with caloric restriction could be helpful in improving the outcome of ischemic cardiac injury in stressed patients.

Abbreviations: CR (caloric restriction), LV (left ventricle), MAPK (mitogen activated protein kinase), IEG (immediate early genes), (APN_1) adiponectin receptors, NO (nitric oxide). eNOS (endothelial nitric oxide synthase).$SIRT_1$ (silent information regulator 1).

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Chronic Intestinal Schistosomiasis Could Be Mistaken for Irritable Bowel Syndrome

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Abstract: Introduction: Irritable bowel syndrome (IBS) is a common medical disorder, reported to occur in 10-20% of the adult population. However, IBS might be a presentation of another intestinal disease acute or chronic. In a previous study of an endemic area of schistosomiasis, 17% of patients who reported lower gastrointestinal tract symptoms, similar to symptoms of IBS, were found to have schistosomiasis. **Objectives:** To assess the incidence of chronic intestinal schistosomiasis in cases coming from endemic areas of schistosomiasis with a clinical diagnosis of IBS. **Materials and Methods:** This prospective study included 90 patients with initial diagnosis of IBS and is coming from endemic areas for schistosomiasis. All patients were planned for a stool analysis, CBC, serum schistosomal antibody and antigen titres, and a colonoscopy and tissue biopsy for shistosomal ova in those with a positive serology testing. **Results:** The most common presenting symptom was recurrent abdominal pain/discomfort in all patients, diarrhea dominant. Stool analysis was negative for schistosomal ova for the whole studied population. A positive sero-diagnosis of schistosomiasis was made in 24 (26.7%) patients. All patients with positive sero-testing (24 patients) had a colonoscopy; with the commonest finding of a flat or slightly raised whitish/yellowish nodules and recto-sigmoid biopsies for a histopathological diagnosis. Most common finding was chronic active schistosomal colitis 16 (17.8%). Re-assessment of symptoms in patients with a confirmed histopathologic diagnosis of schistosomal colitis after treatment at 3 & 6 month was done. **Conclusion:** Our study that it shows that patients with IBS living or coming from endemic areas of schistosomiasis have a 17.8% chance of being misdiagnosed as having IBS. **What's new?** IBS as common diagnosis which is sometimes quickly applied on certain patients in whom another disease condition is the real underlying cause, as applies for patients coming from endemic areas for schostosomiasis and are diagnosed as having IBS, these should be revised.

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Keywords: Chronic liver disease-Colonic disease-colorectal disease-infectious disease-Irritable bowel syndrome.

1. Introduction

Irritable bowel syndrome (IBS) is a common medical disorder, reported to occur in 10-20% of the adult population (1). It is twice as common in women and age of onset is usually second decade (2). Although 1/3 of all cases of IBS involve men, they less frequently seek medical attention (2). IBS is a functional bowel disorder characterized by abdominal discomfort or pain associated with defecation or change in bowel habit and with features of disordered defecation. Chronic, relapsing course, often overlapping with other functional gastrointestinal disorders. Diagnosis is by clinical criteria (the Manning criteria or Rome III criteria), assuming appropriate cost effective exclusion of organic disease. IBS May be classified as diarrhea-predominant or constipation predominant IBS, mixed IBS, or unsubtyped IBS. It Does not predispose patients to other chronic or life-threatening disease and does not shorten the lifespan; however, IBS does disrupt the quality of life. Diagnosis is usually established by the Rome III criteria; however, many patients who do not fulfill the exact criteria may have a variant of IBS and will respond to similar treatment approaches (3). However, IBS might be a presentation of another intestinal disease acute or chronic. In a previous study of an endemic area of schistosomiasis, 17% of patients who reported lower gastrointestinal tract symptoms, similar to symptoms of IBS, were found to have schistosomiasis (4). Previous reports of intestinal schistosomiasis masquerading as IBS are already present (5).

Objectives:

To assess the incidence of chronic intestinal schistosomiasis in cases coming from endemic areas of schistosomiasis with a clinical diagnosis of IBS.

2. Materials and Methods:

This is a prospective study that included 90 patients that presented to the outpatient clinic with abdominal trouble that were initially diagnosed with IBS according to the Rome III criteria with no warning signs. Inclusion criteria included any patient with the diagnosis of IBS and coming from endemic areas for schistosomiasis (mostly rural areas of

Egypt) with a potential for schistosomiasis infection. Exclusion criteria includes patients with a diagnosis for schistosomiasis, patients with alarm signs (progressive pain, pain that disturbs sleep, persistent nausea and vomiting, hematochezia or melena, fecal occult blood positivity, fever, weight loss, or anorexia) that is not compatible with IBS and denotes a more pressing and sinister diagnosis. All patients were planned for a stool analysis, CBC, serum schistosomal antibody and antigen titres, and a colonoscopy and tissue biopsy for shistosomal ova in those with a positive serology testing for schistosomiasis. All cases of IBS were managed appropriately, cases with serological or histopathological confirmation of schistosomiasis were treated with oral praziquantel (40 mg/kg/d PO divided bid for 1 d). Patients with a confirmed diagnosis for schistosomiasis were all followed up for the improvement of their symptoms for a 6 months interval after treatment.

3. Results:

This prospective study included 90 patients with initial diagnosis of IBS and was subjected to the inclusion/exclusion criteria. Their age ranged from15-47 years (mean age31 years). Study included 48 males and 42 females. The presenting symptoms are summarized in table 1, however all patients met the Rome III criteria and the most common presenting symptom was recurrent abdominal pain/discomfort in all patients, diarrhea dominant. Stool analysis was negative for schistosomal ova for the whole studied population. A positive sero-diagnosis of schistosomiasis was made in 24 (26.7%) patients (positive serum schistosomal antibody) from which; 11 patients with active infection (positive serum schistosomal antigen). All patients with positive sero-testing (24 patients) had a colonoscopy and recto-sigmoid biopsies for a histopathological diagnosis; the commonest colonoscopic finding was the presentation of flat or slightly raised whitish/yellowish nodules (results in table 2). Most common histopathological finding was chronic active schistosomal colitis 16 (66.7%) (Results in table 3). Re-assessment of symptoms for the 16 patients with a confirmed histopathologic diagnosis of schistosomal colitis after treatment at 3 & 6 month was done; and the results showed total disappearance of symptoms in 11(68.8%) patients and some improvement in 2 (12.5%) patients and no improvement in 3(18.75%) patients (Table 4).

Table 1. Presenting symptoms.

	N	Percentage(%)
Recurrent abdominal discomfort/pain	90	100%
Relief with defecation	75	83.3%
Onset associated with change in frequency of bowel movement	69	76.7%
Onset associated with change in form of stool	78	86.7%
Passage of mucus	37	41.1%
Bloating and abdominal distention	74	82.2%
Diarrhea dominant IBS	76	84.4%
Constipation dominant IBS	9	10%
Alternating bowel habits IBS	5	5.6%

Table 2. Colonoscopic findings.

Colonoscopic findings*	Number	Percentage %
Normal	7	29.2%
Hyperaemia	6	25%
Flat or slightly raised whitish/ Yellowish nodules	16	66.7%
Loss of vascular pattern	8	33.3%
Ulcerations	2	8.3
Tumor mass	0	0%
Polyp(s)	1	4.2%
Total	24 patients	

*5 patients had a single colonoscopic lesion.
*12 patients had a combination of these findings.

Table3. Histopathologic findings.

	Number	Percentage %
Normal	5	20.8%
Acute schistosomiasis	0	0%
Chronic schistosomal colitis	16	66.7%
Other	3 (2 chronic non-specific colitis – 1 with collagenous colitis)	12.5%

Table4. Response after treatment.

	Number	Percentage% In schistosomal colitis	Percentage in the studied group
Total cure	11	68.8%	12.2%
Partial improvement	2	12.5%	2.2%
No response	3	18.7%	3.3%

4. Discussion:

Irritable bowel syndrome has range of 10-20% in adult population and constitutes 50% of all referrals to a gastroenterologist (6). The syndrome diagnosis 'irritable bowel syndrome is often made on the basis of exclusion, but the question is how many diagnostic tests should be performed in order to establish this diagnosis with a degree of confidence. The potential of the various criteria for distinguishing IBS from organic disease is extremely variable and disappointing. Patients fulfilling IBS criteria have, however, a lower risk of organic disease than patients with abdominal symptoms who do not fulfill the criteria. The same holds true for the diagnostic performance of individual alerting symptoms. These seem to be present frequently in IBS patients in whom there is no underlying organic bowel condition. An organic condition cannot be accurately excluded on the basis of symptom criteria. However, the low prior risk of organic conditions among patients who consult a primary care doctor and who meet IBS criteria argues against exhaustive diagnostic evaluation (7). However, IBS might be a presentation of another intestinal disease acute or chronic. In a previous study of an endemic area of schistosomiasis, 17% of patients who reported lower gastrointestinal tract symptoms, similar to symptoms of IBS, were found to have schistosomiasis (4). Previous reports of cases of intestinal schistosomiasis masquerading as IBS are already present (5). So in our study we prospectively analyzed the incidence of schistosomal colitis that can mimic or can be misdiagnosed as IBS. Our main targeted populations are those presenting with initial diagnosis of IBS according to the Rome III criteria and coming from areas endemic for schistosomiasis with no prior diagnosis of the disease. We found that incidence of schistosomal colitis is 17.8% in the studied group, with a good outcome in symptoms of IBS after treatment of schistosomiasis in 14.4% of the whole group and in 81.3% in patients with chronic schistosomiasis. Schistosomal colonic disease is a major health problem in endemic areas and if not diagnosed and treated early might lead to complications such as chronic intestinal schistosomiasis and hepatosplenic schistosomiasis, which have high morbidity and mortality. The symptoms of colonic schistosomiasis are non-specific and may mimic several other gastrointestinal problems. Colonic mucosa may look normal and biopsies show schistosoma ova (8). This study also showed that the histological findings can be correlated with the endoscopic findings. Conclusion: our study showed that patients with IBS living or coming from endemic areas of schistosomiasis have a 17.8% chance of being misdiagnosed as having IBS, with a chance of cure of colonic schistosomiasis and hence the improvement or disappearance of the IBS symptoms in 14.4%. So in our opinion any patient with IBS specially if diarrhea dominant and has a possibility of being infected with schistosomiasis, should be further investigated with serological testing and colonoscopy and tissue diagnosis as stool analysis is usually negative in chronic cases, for the possibility of schistosomal infection.

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Knowledge and perception towards human trafficking in agrarian communities of Niger Delta, Nigeria

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Abstract: This paper examines the knowledge and perception towards human trafficking in agrarian communities of Niger Delta, Nigeria. This is predicated on the fact that there is high incidence of human trafficking in Nigeria. A large sample size technique n $\geq$ 30 was used to select at least 38 rural dwellers from each of the states. Data were collected through questionnaire which was subjected to face validation and has a reliability coefficient of 0.88. The Statistical Package for Social Sciences (SPSS), was used for data analysis with frequency counts, percentages, means, standard deviation and multiple regression analysis. The results indicated that majority of respondents were males (58.78%), married (51.32%), between 30 and 40 years of age (47.39%), Christians (77.2%) had no formal education (55.7%) domiciled in the communities (52.2%) having between 5 and 8 persons as dependants (49.1%) and had inherited land tenure practice (74.6%). Rural dwellers have negative perception about human trafficking but their knowledge on human trafficking is low. Significant determinants were income (t = 2.64), knowledge (t =4.33) perceived risk (t =-2.88) Education level (t =-3.13) and number of dependants (t =1.93). The policy implications are to introduce measures to counter human trafficking and related awareness campaigns should mainly be targeted to those areas where migration rates are high or on the rise. Life Science Journal. 2011;8(2):821-827] (ISSN:1097-8135). http://www.lifesciencesite.com.

Keywords: Rural dwellers, human trafficking, knowledge perception, agrarian communities, Nigeria

1. Introduction

Agriculture plays a leading role in the non-oil sector of Nigeria. It supports 63 percent of the population directly by providing about 28 percent of the gross domestic product (GDP) from the total exports and 70 percent non-oil export production (Oladele and Sakagami 2004). Nigeria as an agrarian country, the production of foods and other raw materials is a necessary ingredient for the take-off of all other sectors of the nation's economy. About 70% of the Nigerian total labour force is employed within the agricultural sector. Ekong 2003 reported 64% of Nigerians live in rural areas and their primary occupation is farming. However most farming households operate land owned through inheritance and acquisition through family ties. More than 50% of farmers own their lands (Okunmadewa, 2002). According to Rahji (2002), "A key feature of the Nigerian Agriculture is the dominance of small holder farms or farm households …they cultivate less than 5 hectares". The small farmers have limited resources therefore they are dependent on traditional implements; hoes and cutlasses, which in turn limit the output; depend on their efficiency in the utilization of basic production resources available , depend on family and hired labour due to the fact that there is extremely low level of mechanization. In recent times, acute shortage and high cost of farm labour have been reported (Oladele, 2004). This has been partly due to the rural-urban migration and the menace of human trafficking. Oladele and Oladele (2011) reported transhumance as another ploy and form of human trafficking.

UNESCO (2006) defined human trafficking as the recruitment, transportation, transfer, harbouring or receipt of persons, by means of threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. A recent study estimates that at least 12 million people worldwide are trapped in conditions of forced labour. Around a fifth of these are being exploited as a result of human trafficking (ILO 2005). Ofuoku (2010) indicated that the dynamics of human trafficking in Nigeria are geographical in nature which includes internal and cross-border trafficking. Internal trafficking, particularly of women and children has been on the increase in the last two decades (UNESCO, 2006). An increased number of people are trafficked from rural communities in Oyo, Osun and Ogun States in the South-West; Akwa- Ibom, Cross River, Rivers, Bayelsa Delta and states in the South-South; Ebonyi and Imo in the South-East, Benue, Niger and Kwara States in the Middle Belt to city centres (UNESCO, 2006). Those trafficked to these areas are used for exploitative domestic work, farm labour and prostitution. In cross-border trafficking, Nigeria is known to be a source, transit and destination country. Internationally, trafficked

Nigerians come from all parts of Nigeria but some states tend to provide more trafficked persons than others (UNESCO, 2006). These states are Akwa-Ibom, Cross River, Edo, Bayelsa, Delta, Imo, Ebonyi, Kano, Ogun, Oyo and Lagos. The trafficked persons, particularly women and children are taken to destinations such as the Republic of Benin, Togo, Cote d'Ivoire, Equatorial Guinea, Cameroon, Gabon and Guinea in West Africa where they are destined to work mostly as domestic servants and on farm plantations. More specifically, UNESCO (2006) argues that women and children recruited and trafficked from Shaki in Oyo state are mainly sent to Guinea, Mali and Còte d'Ivoire to work as hawkers and domestic servants. Most of them are deceived into believing that their destination is Europe.

Between 1999 and July 2000, anti-traffickers deported about 454 trafficked Nigerians, mostly women and children, from Saudi Arabia (Bassey, 2000). There are indications that Venezuela in South America has also become a point of destination for many people trafficked from Nigeria. Increasing rural-urban migration and poverty have made the labour market super-saturated resulting in a reduction in the value of labour, especially in the informal sector. Labour has become cheap there, forcing every member of the family work outside their homes to sustain the family. There is little systematic knowledge on the knowledge and perception associated with human trafficking among rural dwellers which forms the sources and basis of trafficked persons. Many policy reports and several descriptive papers have discussed the root causes of human trafficking. The factors that are regarded as important are very diverse; they commonly include economic factors such as poverty, unemployment and low wages, issues such as ethnic discrimination and armed conflicts but also institutional weaknesses such as the rule of law and corruption, or deficient implementation of international legislation. While theory is scarce, empirical evidence is even scarcer. Literature surveys in recent years have frequently highlighted the need for rigorous empirical research in human trafficking. Akee et al. (2007) analyze the determinants of trafficking of children and women in a cross-country setting. Relying on country-by-country reports of the US Department of State and the Protection Project they construct dummy variables for the incidence of trafficking between countries. This paper provides household level evidence of the knowledge and risks associated with human trafficking.

The immediate impact of human trafficking on rural dwellers is the loss of labour on the farm which makes their production to suffer setbacks. The awareness and knowledge of rural dwellers of the attendant consequences of the conditions of trafficking determine the perception which could influence their propensity to support and participate in human trafficking. Perception is described as a process by which persons organize, interprets and react to sensory 'impressions' so as to give meaning to their social environment (Hikson and Keith, 2000). This is often affected by the characteristics of the perceiver, object or target being perceived, the relationship of the object being perceived to the environment, the content and time at which the object is perceived, and attribution of the perceiver. Assessing rural dwellers' perceptions is an important means to evaluate their knowledge level on a particular issue, as perception refers to an individual's current appraisal of an object or program (Hikson and Keith, 2000). Farouque and Takeya (2007) conclude that people base their perceptions on past experience and knowledge; therefore, if a person has limited knowledge and experience about a topic, then they can not accurately perceive it or form an opinion. The objective of the study is to determine rural dwellers' perception towards human trafficking in Nigeria

2. Materials and Methods

The study was carried out in Niger Delta area of Nigeria. This includes six states, namely, Anambra, Bayelsa, Delta, Edo, Imo and River States. These six states occupy the South-South part of Nigeria, all of them lying side by side, starting with Edo going from the western part of the country followed by Delta Anambra, Imo, Bayelsa, Rivers, States, bound by the Atlantic Ocean on the south. The population for the study consisted of all rural dwellers in agrarian communities of Niger Delta. A large sample size technique $n \geq 30$ was used to at least 38 select rural dwellers from each of the states. The questionnaire was face validated by Lecturers in the Department of Agricultural Extension and Rural development, Sociology of the University of Ibadan, Nigeria. Data collected were analyzed using Statistical Package for Social Sciences (SPSS), with frequency counts, percentages, means, standard deviation and multiple regression analysis.

3. Results

The results from the study covered the personal characteristics of rural dwellers in Niger Delta region of Nigeria in Table 1, perception of rural dwellers towards human trafficking in Table 2, knowledge of human trafficking in Table 3 and multiple regression analysis showing relationship between perception towards human trafficking and socio-economic characteristics in Table 4.

Table 1: Personal characteristics of rural dwellers in Niger Delta region of Nigeria

Characteristics	**Frequency**	**Percentage**
Gender		
Males	134	58.78
Females	94	41.22
Marital status		
Single	64	28.1
Married	117	51.32
Divorced	23	10.11
Widowed	24	10.53
Age		
Less than 30	24	10.53
30-40	108	47.39
Above 40	96	42.10
Religion		
Christianity	176	77.2
Islam	38	16.67
Traditional	14	6.1
Education		
No formal education	53	23.25
Primary school	51	22.37
Secondary School	19	8.3
Tertiary	31	13.6
Adult education	74	32.4
Status in Community		
Domiciled	119	52.2
Not Domiciled	109	47.8
Number of dependants		
1-4	76	33.33
5-8	112	49.12
Above 8	40	17.54
Land Acquisition:		
Inherited	170	74.56
Purchased	37	16.23
Leased	21	9.21

Table2: Perception of rural dwellers towards human trafficking

Attitudinal statements	Mean	SD
Economic hard ship encourages human trafficking	4.53	0.8
Intimidation and threats involved in human trafficking are part of life-risks	4.57	0.8
Psychological abuse is not only limited to human trafficking	3.83	0.8
Emotional and physical abuse is not limited to human trafficking	4.79	0.8
The get rich quick syndrome promotes human trafficking	4.59	0.7
Structural adjustment programme impoverishment led to high incidence of human trafficking	3.39	0.4
Social isolation promotes human trafficking	3.47	0.4
Privatization of public goods and services encourage human trafficking	3.64	0.5
Participation in human trafficking is criminal	3.97	0.4
Human trafficking provides cheap labour	3.90	0.4

Human trafficking encourages profit margin of enterprises	3.67	0.3
There is high demand for services and labour of trafficked persons	3.51	0.3
The impact of economic reforms encourages human trafficking	3.92	0.4
Poor impact of development programme encourages human trafficking	4.21	0.5
I cannot participate in human trafficking	4.16	0.5
I can allow my wards to participate in human trafficking	3.71	0.4
Changes in social welfare encourages human trafficking	3.68	0.3
Political instability promotes human trafficking	3.51	0.3
Poor law enforcement encourages human trafficking	3.82	0.3
My religion does not allow human trafficking	3.87	0.4
I can temporarily allow participation human trafficking	3.52	0.3
Unemployment is root cause of human trafficking	3.59	0.3
Discrimination within society causes human trafficking	3.62	0.4
Corruption induces human trafficking	3.68	0.3
Family violence promotes human trafficking	2.39	0.2
Juvenile delinquency stimulates human trafficking	4.18	0.5
Family separation(divorce) encourages human trafficking	2.99	0.3

Table 3: Respondents' knowledge of human trafficking

Knowledge items on human trafficking	True	False
Human trafficking withholds legal rights of the victim	85(37.3)	143(62.7)
Human trafficking posses threats and acts of physical harm to victims and family	82(36.0)	146(64.0)
Human trafficking subjects their victims to rape and kidnapping	81(35.5)	147(64.5)
Human trafficking confines their victims to isolation	69(30.3)	159(69.7)
Human trafficking denies their victims medical care	131(57.5)	97(42.5)
Human trafficking inflicts manipulation and psychological abuse on victims	48(21.1)	180(78.9)
Human trafficking involves recruiting, harbouring and obtaining persons against their will	89(39.0)	139(60.9)
Human trafficking does not require any transportation	33(14.5)	195(85.53)
Human trafficking involuntary servitude	46(20.2)	182(79.8)
Human trafficking put people in debt bondage	72(31.6)	156(68.4)
Human trafficking involves holding people against their will to pay off a debt	72(31.6)	156(68.4)
Human trafficking lures through false promise of good working conditions and high pay	74(32.5)	154(67.5)
Human trafficking explores victims for their own financial	69(30.3)	159(69.7)
Human trafficking exposes victims to unsafe, unpredictable and uncontrollable events	90(39.5)	138(60.5)
Human trafficking exposes to drugs and drug addition	139(60.9)	94(41.2)
Trafficked persons are often used for stripping/exotic dance is a	88(38.6)	140(61.4)
Use of persons for pornography is a form of human trafficking	67(29.4)	161(70.6)
Use of persons in massage palors is a form	71(31.1)	157(68.9)
Trafficked persons are often used for agriculture and labour	57(25.0)	171(75.0)
Trafficked persons are often used for factor work/sweat shops	81(35.5)	147(64.5)
Trafficked persons are often used for prostitution	44(19.3)	184(80.7)
Trafficked persons are often used for mail order brides	63(27.6)	165(72.4)
Trafficked persons are often used for domestic servitude	61(26.8)	167(73.3)
Trafficked persons are often used for food service	55(24.1)	173(75.9)
Trafficked persons are often used for entertainment and modelling sex slaves	54(23.7)	174(76.3)
Trafficked persons are often used as drug transporters and mules	58(25.4)	170(74.6)
Trafficked persons are often used for cheap source of labour	67(29.4)	161(70.6)
Human trafficking deprive rural communities of labour	40(17.5)	188(82.5)

Table 4: Multiple regression analysis showing relationship between perception towards human trafficking and socio-economic characteristics

	Reg. Coeff	SE	t	p
(Constant)	-2.55	1.30		0.05
Income	1.35	0.51	2.64	0.005
Knowledge	1.08	0.24	4.33	0.00
Risk	-0.23	0.08	-2.88	0.02
Gender	0.06	0.08	0.75	0.96
Marital status	0.17	3.45	0.04	0.80
Age	4.05	2.24	1.80	0.07
Religion	3.98	3.16	1.26	0.20
Education	-2.66	0.85	-3.13	0.006
Status in community	0.12	0.76	.16	0.86
No Dependants	1.18	0.61	1.93	0.05
Land acquisition	0.14	0.49	29	0.72
F	2.54			
p	0.005			
R	0.68			
R square	0.46			

4. Discussion

The personal characteristics of rural dwellers examined in the study were presented in Table1; the results indicated that majority of respondents were males (58.78%), married (51.32%), between 30 and 40 years of age (47.39%), Christians (77.2%) had no formal education (55.7%) domiciled in the communities (52.2%) having between 5 and 8 persons as dependants (49.1%) and had inherited land tenure practice (74.6%). This finding is similar to the findings of Yomi-Alfred (2000), and Ladapo and Oladele (2011) who found that 15% and 42.5% of rural people in Yagba East in Kogi state were in age bracket 30years or less and 30-49 years old respectively and because agriculture in the rural areas is labour intensive, farmers, though young may therefore be married in order to increase farm labour (Ladele and Omotesho, 2000). Farinde and Soetan (1999) reported that 82% of the rural dwellers in south western Nigeria had primary school education or less.

Table 2 shows a list of 27 perception statements about attitude of human trafficking. The respondents were asked to rate the statements using 5 Likert scale as follows; 1(strongly disagree), 2 (Disagree) 3(Uncertain) 4 (Agree) and 5 (Strongly agree). The scoring was reversed for negative statements. The actual mean is 3 due to the rating scale and a mean of greater than 3 denoted a positive attitude while a mean less than 3 denoted negative attitude towards perceived risks associated with human trafficking. The results revealed an overwhelming general positive attitude by rural dwellers towards the perceived risks associated with human trafficking. Of the 27 statements, 25 of the attitudinal statements were above the cut-off point of 3. The most prominent attitudinal statement as ranked by the by rural dwellers were economic hardship encourages human trafficking (4.53), juvenile delinquency stimulates human trafficking (4.18), poor impact of development programme encourages human trafficking (4.21), I cannot participate in human trafficking (4.16). This may be attributed to the fact that increasingly difficult means of sustainable livelihood would predispose rural dwellers to human trafficking. Mahmoud and Trebesch (2008) noted that a significant link between risk perception and trafficking exits, such that in regions where more people are aware of the phenomenon of human trafficking, the likelihood of trafficking is lower. This finding, although not fully robust, underlines the potential benefit of awareness campaigns to counter human trafficking. Ngban et al 2009 reported similar findings on perception of human trafficking in the South-South Zone of Nigeria. Conversely rural dwellers were negatively disposed to attitudinal items such as family separation (divorce) encourages human trafficking (2.99) and ffamily violence promotes human trafficking (2.39). Mahmoud and Trebesch (2008) indicated that, remoteness and low socioeconomic development do not appear to matter much for trafficking risks. A lower quality of public services as measured by low density of physicians and high infant mortality rates,

the household's locality (rural or urban), and low wages compared to the capital town do not increase the likelihood of trafficking in a five eastern European city. This is however not applicable in terms of facilities in rural Nigeria.

Table 3 shows rural dwellers' knowledge of human trafficking. The results reveal that rural dwellers had a wide range of knowledge levels regarding human trafficking. No respondents answered all of the knowledge test questions incorrectly, nor did any respondent answer all questions correctly. Majority of the rural dweller had low knowledge about human trafficking. From Table 3 most of items had the highest percentages in the false column which shows that the responses were not right for many of the items. About 61% of the rural dwellers responded correctly only on the item on "human trafficking exposes to drugs and drug addiction". This may be because of low awareness about the consequences of human trafficking among the rural dwellers. Ofoku (2010) stressed the need for effective campaign among rural dweller as a means to increase awareness and reduce the propensity to participate in human trafficking. Ngban et al (2009) recommended a massive and aggressive public enlightenment campaign was recommended to better their perception of the human trafficking pandemic.

The result of multiple regression analysis of relationships between rural dwellers' perception towards human trafficking and socio-economic characteristics were presented in Table 4. The independent variables were significantly related to perception towards human trafficking with F value of 2.54, $p < 0.05$. Also, R value of 0.68 showed that there was a strong correlation between independent variables and perception towards human trafficking. The result further predicted 46 percent of the variation in perception towards human trafficking by rural dwellers. Significant determinants were income ($t = 2.64$), knowledge ($t = 4.33$) perceived risk ($t = -2.88$) Education level ($t = -3.13$) and number of dependants ($t = 1.93$). It implies that as rural dwellers' income increases, knowledge increases, perceived risk decreases education level decreases and number of dependants increases the higher the perception towards human trafficking. The significant contribution of level of education may not be unconnected with the fact that majority of these respondents were not highly educated and hence, they may not know the implication. Ngban et al (2009) stated that demographic variables such as age, gender and residential location influence their perception of human trafficking in the South-South Zone of Nigeria

This paper has shown that majority of rural dwellers in Niger Delta region are males, married, between 30 and 40 years of age, had no formal education and having between 5 and 8 persons as dependants. They have negative perception about human trafficking but their knowledge on human trafficking is low. The perception about human trafficking was determined by income, knowledge, perceived risk, Education level, and number of dependants. The propensity of rural dwellers to participate in human trafficking will be as a result of high level of poverty which is in connection with their number of household. Majority of them have large family sizes. The low level of knowledge of the attendants problems associated with human trafficking has made them to continually fall prey to traffickers. Lastly perception of rural dwellers towards human trafficking could be improved if their ignorance about the 'totality' of human trafficking is reduced or completely eradicated. To reduce the occurrence of Human trafficking adequate knowledge and awareness of the attendant problems associated with Human trafficking need to be created amongst the rural dwellers. The policy implications of the findings are that policy measures to counter human trafficking and related awareness campaigns should mainly be targeted to those areas where migration rates are high or on the rise. Activities to address the areas of need that predisposes rural dwellers to human trafficking should be addressed such as community development and means of sustainable livelihoods to the rural dwellers.

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Potential Health Impact of Black Tea against Na-F-Induced Alterations in Territorial Aggression, Sexual Behaviour and Fertility of Male Rats

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Abstract: In an extension of previous work on sodium fluoride (Na-F) toxicity, the ameliorative effect of black tea on Na-F-induced behavioural and reproductive toxicity was evaluated in male rats in terms of territorial aggressive behaviour, sex behaviour, along with fertility indices. Oral administration of 100 ppm Na-F and 2% black tea to eighty weanling 32-days old male Wistar rats, randomly allotted into 4 groups of 20, were performed daily for 14-weeks treatment period in a 2 x 2 factorial manner. A marked suppression in all parameters of territorial aggression was seen in adult male Na-F-treated rats. This suppression was significantly alleviated when black tea was concurrently administered. Ingestion of black tea alone significantly improved territorial aggression responses, namely lateralization and boxing bouts. The ingested Na-F also suppress sexual behaviour in adult male rats expressed by a prolongation of first mount, intromission and ejaculation latencies, decrease in numbers of mounts, intromissions and ejaculations along with increased post-ejaculatory intervals. A profound ameliorative effect was noted for all abolished male sex behaviour when black tea solution was supplemented to Na-exposed rats. Black tea exhibited an aphrodisiac tendency when solitary administered to male rats, as reflected in significant shortening of mount and intromission latencies as well as increase in mount and intromission frequencies. This aphrodisiac activity was not associated with influence on ejaculation-related parameters. Furthermore, an obvious impairment in all fertility indices was detected in Na-F-treated males as displayed by reduced numbers of impregnations, implantations and viable fetuses accompanied by increased resorptions. This observed diminution in fertility was significantly mitigated by black tea. Similarly, the lessening effect of Na-F on relative weights of male sex organs was noticeably improved when black tea was given. Our histopathological investigations revealed severe degenerative changes in testes, seminal vesicles and prostate gland. Combined administration of black tea with Na-F resulted in marked amelioration of the pathological alterations. Our study denotes a powerful mitigative effect of black tea in combating behavioural and reproductive toxicity triggered by Na-F as signified by harmed aggressive and sexual behaviour together with abolished fertility in adult male rats. Our findings also evidently point toward the aphrodisiac property of black tea which might be of help in certain forms of sexual dysfunction in male individuals.
[Heba S. El-lethey[1], Mervat M. Kamel[1*]and Iman B. Shaheed[2] Potential Health Impact of Black Tea against Na-F-Induced Alterations in Territorial Aggression, Sexual Behaviour and Fertility of Male Rats. Life Science Journal. 2011;8(2):828-839] (ISSN: 1097-8135). http://www.lifesciencesite.com.

Key words: Sodium fluoride, black tea, territorial aggression, sex behaviour, fertility, Wistar rats.

1. Introduction

Major sources of individuals' exposure to fluorides are the diet (food, water, beverages) and fluoridated dentifrices (toothpastes and other preparations for cleaning teeth). Exposure to fluoride has been reported to interfere with the functional status of several tissues and organs, causing toxic hazards, namely of reproductive effects (Al-Hiyasat et al., 2000; Dhar and Bhatnagar, 2009). Epidemiological studies have shown that there is an association of decreasing total fertility rate with increasing fluoride levels in drinking water (Freni, 1994). Additionally, previous hazard identification studies in male rodents have evidenced reproductive toxicity of sodium fluoride in concentrations higher than the permissible level (Narayana and Chinoy, 1994; Elbetieha et al., 2000; Chinoy and Sharma, 2000). However, so far these studies have focused mainly on structural and functional defects in spermatozoa (Kumar and Susheela, 1994; Chinoy and Sharma, 1998), a decrease in sperm count (Ghosh et al., 2002; Pushpalatha et al., 2005), disturbances in the levels of reproductive hormones (Ortiz-Perez et al., 2003), alterations in the epididymis and accessory reproductive glands (Chinoy and Sequeira, 1989; Kumar and Susheela, 1994; Tiwari and Pande, 2009) and interference with fertility (Chinoy and Sequeira, 1992; Elbetieha et al., 2000). In contrast to reproductive toxicity of fluoride, less is known about its effect on sexual behaviour, an androgen dependent behaviour. It is noteworthy that suppression of endogenous testosterone secretion has been reported following fluoride treatments (Huang et al., 2007; Reddy et al., 2007). Thus, the possibility cannot be excluded that fluoride might eliminate the expression of male sex behaviour. Also, androgens have long been recognized as modulators of aggression in male rats (Blanco et al., 1997). Many studies of androgens

effects on aggression have focused on inter-male aggression, a pattern of aggressive behavior that is dependent on presence of androgens (Christie and Barfield, 1979). Inter-male aggression can be measured by assessing the quality and quantity of aggressive acts displayed by a 'resident' male towards a strange or 'intruder' male.

Fluorosis, being an untreatable disease, can only be mitigated through prevention and control. Nutritional supplementation has to be practiced for combating with the health complaints arising due to fluorosis. Natural antioxidants with free radical-scavenging activity such as tea flavonoids have received much attention as potential, non-toxic treatments for oxidative stress-related pathological conditions (Serafini et al., 1996; Leung et al., 2001; Satoh et al., 2005; Trivedi et al., 2006; Ojo et al., 2007). Although the sexual stimulant activities of black tea have been advocated, animal studies addressing the effects of black tea exposure on sexual competence, are very limited in number and further research are essential in order to scientifically test and validate this conjecture (Ratnasooriya and Fernando, 2008).

So far, no studies appear to have tested the possible effect of black tea on reproductive dysfunction due to fluoride exposure. Therefore the present work was the first attempt to evaluate the potential mitigative effect of black tea against sodium fluoride-induced behavioural and reproductive toxicity represented by modulations of territorial aggressive, and sex behaviours together with fertility profile in adult male rats. Reproductive histopathological investigations were also designed to represent the possible effects on sex organs in males.

2. Materials and Methods:

2.1. Animals and housing:

Animal care as well as the experimental protocols was in compliance with guidelines of ethical standards released by Cairo University Policy on Animal Care and Use. In order to minimize animals' suffering we intended only to use the adequate minimal number of animals requested to produce reliable scientific data.

The study was performed on a total of eighty weanling 32-days-old male Wistar rats, weighing approximately 45g. Animals were procured from the Unit for Laboratory Animals at Faculty of Veterinary Medicine, Cairo University and employed in our study. They were housed in standard polypropylene cages with stainless steel wire lids, bedded with wood shavings at a temperature (20-22°c), humidity (60%) and photoperiod (12-h light/dark cycle). Standard laboratory feed and distilled water were freely available except during the time of the experiments.

2.2. Experimental design:

All males were randomly assigned into four groups of 20, divided on 2 replicates and orally administered our treatments for a 14-weeks period, in a 2 x 2 factorial design as follows:

Group (1) control (C), n=20: Weanling pups were administered plain water.

Group (2) Na-F group (F), n=20: Weanling pups were exposed to *ad libitum* supply of Na-F alone (Sigma Chemical Company) in drinking distilled water at 100 ppm on a mg/kg/day basis of 10.77 Na-F (Chioca et al., 2008).

Group (3) black tea group (T), n=20: Weanling pups were exposed to *ad libitum* supply of 2% black tea alone in drinking water (Trivedi et al., 2006). Twenty grams of black tea solids (Lipton Yellow label, Unilever Limited, India) and 1000 ml boiled drinking water were used to produce a 2% tea solution.

Group (4) ameliorated group (Na-F+T), n=20: Weanling pups were exposed to *ad libitum* supply of 100 ppm Na-F in combination with 2% black tea solution.

2.3. Behavioural testing procedures:

At 130 days of rats' age, territorial aggression was studied first, then the sexual behaviour and finally the fertility indices in all experimental groups. All behavioural measurements were monitored by a single observer unaware of the experimental treatment.

2.3.1. Resident-intruder test of territorial aggression:

A rectangular observation cage (45 x 27 x 40 cm: length x breadth x height) was used for evaluation of aggressive behaviour in rats. A stud male rat was placed in the testing arena for 10 days and served as the resident. The tested male rat (intruder) of no previous contact with the resident was then placed into the test arena, confronted with the resident male for 5-min test period. The following aggression parameters were then recorded: lateralization by stud male (LSM), boxing bouts with stud male (BBSM), fights with stud male (FSM), ventral presenting posture (supine posture) of the stud male (VP) (Hilakivi and Lister, 1989; Bataineh et al., 1997, Bataineh et al., 1998; Khouri and El-Akawi, 2005). All testing was carried out between 09:00 and 12:00 h. The four experimental groups were tested in a random array.

2.3.2. Sexual behaviour test:

Sexual behaviour of male rats was assessed using a stimulus-receptive untreated female of the same strain. Female receptivity was induced by the sequential subcutaneous administration of 5 mg

estradiol benzoate and 0.5 mg progesterone (Misr Co. for Pharm. Ind., Cairo, Egypt), dissolved in 0.2 ml of sesame oil, at 54 and 6 h before the sexual behaviour study, respectively. Single male rat was placed alone in the mating cage (45 x 27 x 40 cm: length x breadth x height), and allowed to acclimate for 5 min. Then the sexually receptive female rat was introduced into the center of the arena. Sexual behaviour of the male was monitored during a 15-min session and the following parameters were registered;
(1) mount latency (ML): time from the introduction of the female until the first mount, (2) intromission latency (IL): time from introduction of the female until the first intromission, (3) ejaculation latency (EjL): timefrom the first intromission until ejaculation, (4) total mount frequency (TMF): total number of mounts during test session, (5) total intromission frequency (TIF): total number of intromissions during test session, (6) ejaculation frequency (EjF) i.e. mating potential: total number of ejaculations during test session, (7) post-ejaculatory interval (PEjI): time from ejaculation until the next intromission **(**Ågmo, 1997; Cagiano et al., 1998; Khouri and El-Akawi, 2005; Bataineh and Nusier, 2006). Also, the following parameter was calculated on the basis of the above data: (8) intromission ratio (IR): intromission frequency/(mount frequency + intromission frequency), (9) copulatory efficacy (CE): intromission frequency/mount frequency). All measurements were conducted between 09:00 and 15:00 h in a randomized order.

2.4. Fertility assessment:

Male rats' fertility was evaluated by natural mating. Each male was individually housed with two virgin untreated females of the same strain for ten days to ensure two successive estrus cycles (Amann, 1982). One week after removal of the males, all females were killed by cervical dislocation under light ether anesthesia. Numbers of impregnated females, implantation sites, viable fetuses as well as fetal resorption sites were recorded after cesarean sections (Bataineh et al., 1998).

2.5. Relative weights of male reproductive organs:

The final body weights of five male rats per treatment were recorded. Rats were then sacrificed by cervical dislocation under light ether anesthesia Their sex organs; testes, seminal vesicle and prostate gland were dissected out, freed from adherent tissues and blood, and weight to the nearest milligram in relation to body weight.

2.6. Histopathological examination:

After completion of all assessments, tissue specimens from testes, seminal vesicles and prostate glands were assembled and fixed in 10% neutral buffer formalin. The tissue specimens were processed by the convention method and stain with Hematoxylin and Eosin (Bancroft and Gamble, 2008**)**.

2.7. Statistical analysis:

Statistical tests were performed using the general linear models procedure in SPSS® statistical software (SPSS, 2006). Data for behaviour, fertility as well as sex organs weights were analyzed using two-way ANOVA. Post hoc comparisons between the groups after ANOVA were made using post hoc Tukey HSD test. Differences at the probability level *P*, 0.05 were considered significant. The results were expressed as mean ± SEM.

3. Results:

3.1. Territorial aggressive behaviour parameters:

Measurements of territorial aggression in adult male rats were demonstrated in Table 1. A significant profound lessening effect was noted for all parameters including; lateralization, boxing bouts, fighting and number of ventral presenting postures ($p < 0.001$) in Na-F-exposed rats when compared with controls. Simultaneous administration of black tea to Na-F-treated rats resulted in a significant recovery in all territorial aggressive parameters, to the level of control group ($p = 0.10, 0.14, 0.79$, and 0.15), respectively. As compared with respective control group, administration of black tea alone significantly advanced lateralization and boxing bouts ($p < 0.05$). Although there was a tendency to increase fighting as well as ventral presenting postures in tea-administered group, this result did not attain a recognized significant level, when compared to control.

3.2. Sexual behaviour:

Parameters related to male rats sexual behaviour were demonstrated in Table 2. Treatment with Na-F induced significant increase ($p < 0.001$) in mount, intromission and ejaculation latencies in comparison with corresponding values of control rats. In addition, there was a significant diminution ($p < 0.001$) in frequencies of all previously declared parameters. A significant prolongation ($p < 0.001$) in post-ejaculatory intervals was also detected in Na-F-exposed rats, compared with the controls. Administration of black tea along with Na-F significantly ($p < 0.001$) ameliorated all Na-F-induced changes in sex behaviour of males. The amelioration was similar to the level observed in the control group ($p = 0.08, 0.13, 0.19, 0.15, 0.30, 0.30$ and 0.11) for all recorded parameters, respectively. Supplementation with black tea solution alone revealed significant suppression ($p < 0.001$) in mount

and intromission latencies, whereas the ejaculation latencies were not significantly varied (p = 0.13) from those in control group. Similarly, black tea-ingested rats displayed significantly higher ($p < 0.001$) frequencies of mounts and intromissions, with no significant influence on parameters of ejaculation frequencies as well as post-ejaculatory intervals (p = 0.60, 0.28), respectively.

3.3. Male rats' fertility:

As seen in Table 3, oral administration of Na-F, as compared with control group, caused significant adverse effects on all fertility indices in male rats in terms of diminished numbers of impregnations ($p < 0.001$), implantation sites ($p < 0.001$) as well as viable fetuses ($p < 0.01$) along with increased numbers of resorption sites ($p < 0.01$). The prominence of black tea was only restricted to its ameliorative effect, where concurrent administration of black tea significantly alleviated Na-F-provoked negative consequences on the entire profile of fertility in males. Black tea ameliorative effect was significantly comparable to control group for all stated parameters (p = 0.33, 0.55, 0.85 and 0.97), respectively.

3.4. Reproductive organs weights:

Relative weights of male reproductive organs; testes, seminal vesicles and prostate gland were illustrated in Table 4. Exposure of rats to Na-F significantly reduced ($p<0.001$) relative weights of all collected reproductive organs, when compared to their counterparts in control group. Significant effect noticed for black tea was only ameliorative when tea was simultaneously ingested with Na-F, where comparable weights were shown in both ameliorated and control groups for testes, seminal vesicles and prostate (p=0.89, 0.77, 0.82), respectively.

3.5. Histopathological examination:

No pathological changes could be detected in the testes, seminal vesicle and prostate glands of rats in control group as well as their counterparts received black tea alone.

The testes of Na-F-treated rats showed severe pathological lesions represented by severe disorganization and denudation of germinal epithelial cells of most seminiferous tubules with absence of sperm in the lumina (Fig. 1). Only the basement membranes were detected with multiple numbers of spermatid giant cells. Congestion of blood vessels in tunica albuginea and edematous fluid were detected in-between the interstitial tissues (Fig. 2). Some tubules were completely destructed.

The seminal vesicle revealed hyperplasia of the epithelial lining with desquamated epithelial cells in the lumen mixed with its secretion (Fig. 3). There was edema in the lamina propria and congestion of submucosal blood vessels.

The prostate gland exhibited edema in the interstitial tissues dispersed the glands. There was severe hyperplasia of epithelium lining as folds in the lumen (Fig. 4). Few numbers of inflammatory cells were detected in the interstitial tissues.

Regarding the rats exposed to Na-F along with black tea, their testes displayed mild pathological changes represented by decrease the numbers of mature sperms in the lumen of some seminiferous tubules (Fig 5). Most of tubules were appeared with normal germinal epithelium and large numbers of matures sperms in their Lumina (Fig. 6).
No pathological alterations could be detected in seminal vesicles of rats of the ameliorated group (Fig. 7), while prostate gland showed mild hyperplastic changes with edema in interstitial tissues (Fig. 8).

Table 1. Effect of Na-F and its amelioration by black tea on territorial aggression in adult male rats during a 5 min session.

	Experimental Groups			
	(C) Group	(Na-F) Group	(T) Group	(Na-F+T) Group
LSM	**6.10±0.74^{a}**	**1.60±0.51^{b}**	**8.20±0.53^{c}**	**4.30±0.42^{a}**
BBSM	**4.90±0.31^{a}**	**1.00±0.32^{b}**	**6.80±0.61^{c}**	**3.50±0.50^{a}**
FSM	**2.60±0.43^{ac}**	**0.60±0.19^{b}**	**3.70±0.30^{c}**	**2.10±0.46^{a}**
VP	**1.50±0.22^{ac}**	**0.10±0.03^{b}**	**1.80±0.20^{c}**	**0.90±0.23^{a}**

(C) Group: Animals received plain water without any treatment and served as a control.
(Na-F) Group: Animals received 100 ppm Na-F. (T) Group: Animals received 2% black tea solution alone.
(Na-F+T) Group: Animals received 100 ppm Na-F + 2% black tea solution.
$^{a-c}$Values within row with unlike superscripts differ significantly **($p<0.05$)**, according to ANOVA. Data are expressed as mean±SEM of 10 animals per treatment.
(LSM = lateralization by stud male, BBSM = boxing bouts with stud male, FSM = fights with stud male, VP = ventral presenting posture (supine posture) of the stud male.

Table 2. Effect of Na-F and its amelioration by black tea on sexual behaviour in adult male rats during a 15 min session.

	Experimental Groups			
	(C) Group	(Na-F) Group	(T) Group	(Na-F+T) Group
ML (s)	109.2±15.64[a]	248.3±12.07[b]	65.00±4.21[c]	149.2±10.18[a]
IL (s)	118.80±12.49 [a]	263.5±10.94[b]	69.70±3.91[c]	146.7±4.03[a]
EjL (s)	143.10±9.02[ac]	289.00±17.40[b]	102.50±10.32[c]	179.9±12.67[a]
TMF	13.00±0.30[a]	4.1±0.81[b]	15.90±0.38[c]	11.20±0.36[a]
TIF	12.30±0.26[a]	2.80±74[b]	15.10±0.35[c]	10.40±0.34[a]
EjF	4.90±0.46[ac]	0.80±0.25[b]	5.50±0.34[c]	4.00±0.26[a]
PEjI	73.10±2.95[ac]	245.6±15.91[b]	50.70±3.60[c]	101.6±4.98[a]
IR	0.49±0.01	0.34±0.06	0.49±0.01	0.48±0.01
CE	0.95±0.03	0.62±0.12	0.95±0.02	0.93±0.02

(C) Group: Animals received plain water without any treatment and served as a control.
(Na-F) Group: Animals received 100 ppm Na-F.
(T) Group: Animals received 2% black tea solution alone.
(Na-F+T) Group: Animals received 100 ppm Na-F + 2% black tea solution.
[a-c]Values within row with unlike superscripts differ significantly **($p<0.05$)**, according to ANOVA. Data are expressed as mean±SEM of 10 animals per treatment.
(ML = mount latency, IL = intromission latency, EjL = ejaculation latency, TMF = total mount frequency, TIF = total intromission frequency, EjF = ejaculation frequency (mating potential), PEjI = post-ejaculatory interval (latency period), IR (intromission ratio) = no. of intromissions/(no. of intromissions + no. of mounts), CE (copulatory efficiency) = no. of intromissions/no. of mounts.

Table 3. Effect of Na-F and its amelioration by black tea on fertility in adult male rats.

	Experimental Groups			
	(C) Group	(Na-F) Group	(T) Group	(Na-F+T) Group
No. of males	10	10	10	10
No. of females	20	20	20	20
No. of pregnant females	18/20[a] (90%)	7/20[b] (35%)	20/20[a] (100%)	14/20[a] (70%)
No. of implantation sites	7.85±0.70[a]	3.00±1.02[b]	8.35±0.69[a]	6.25±0.97[a]
No. of viable fetuses	6.10±0.57[a]	2.45±0.85[b]	7.45±0.48[a]	5.30±0.82[a]
Rats with resorptions	1/20 (5%)	7/20 (35%)	1/20 (5%)	3/20 (15%)
No. of resorption sites/total no. of implantation sites	1/157[a] (0.64%)	15/60[b] (25%)	1/167[a] (0.60%)	3/125[a] (2.4%)

(C) Group: Animals received plain water without any treatment and served as a control.
(Na-F) Group: Animals received 100 ppm Na-F.
(T) Group: Animals received 2% black tea solution alone.
(Na-F+T) Group: Animals received 100 ppm Na-F + 2% black tea solution.
[a-c]Values within row with unlike superscripts differ significantly **($p<0.05$)**, according to ANOVA. Data are expressed as mean±SEM.

Table 4. Effect of Na-F and its amelioration by black tea on reproductive organs weights (g/100g b.wt) in adult male rats.

	Experimental Groups			
	(C) Group	(Na-F) Group	(T) Group	(Na-F+T) Group
Testes	1.47±0.05[ac]	0.91±0.06[b]	1.52±0.04[c]	1.29±0.04[a]
Seminal vesicles	0.69±0.05[ac]	0.41±0.03[b]	0.73±0.02[c]	0.58±0.02[a]

Prostate gland	**0.34±0.02[ac]**	**0.20±0.01[b]**	**0.37±0.01[c]**	**0.28±0.02[a]**

(C) Group: Animals received plain water without any treatment and served as a control.
(Na-F) Group: Animals received 100 ppm Na-F.
(T) Group: Animals received 2% black tea solution alone.
(Na-F+T) Group: Animals received 100 ppm Na-F + 2% black tea solution.
[a-c]Values within row with unlike superscripts differ significantly **($p<0.05$)**, according to ANOVA. Data are expressed as mean±SEM of 5 animals per treatment.

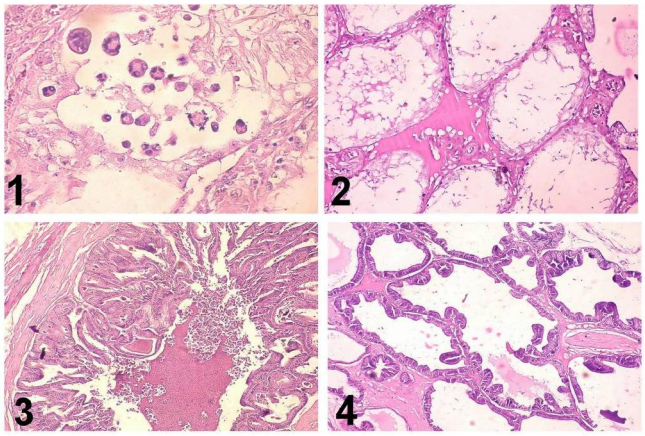

Figure 1: Testes of Na-F-treated rats, showing complete necrosis of germinal epithelium of seminiferous tubules with multiple numbers of spermatid giant cells. H&E X 400.
Figure 2: Testes of Na-F-treated rats, showing edema in-between the seminiferous tubules. Notice the complete absence of germinal epithelium and Sertoli cells of seminiferous tubules. H&E X 200.
Figure 3: Seminal vesicles of Na-F-treated rats, showing hyperplasia of the epithelial lining with desquamated epithelial cells in the lumen mixed with its secretion. H&E X 200.
Figure 4: Prostate gland of rat Na-F-treated rats, showing severe hyperplasia of epithelium lining forming finger like projection in the lumen. Notice the edema in-between the glands. H&E X 200.

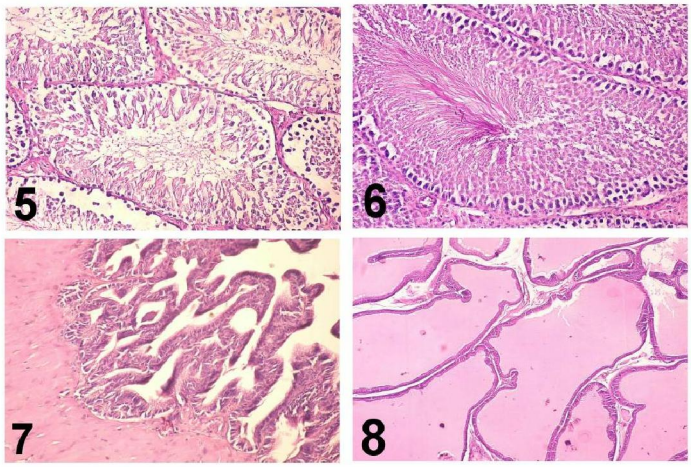

Figure 5: Testes of rats received Na-F along with black tea, showing few numbers of mature sperms in the lumen of seminiferous tubules. H&E X 200.
Figure 6: Testes of rats received Na-F along with black tea, showing normal appearance of seminiferous tubules. H&E X 400.
Figure 7: Seminal vesicle of rats received Na-F along with black tea, showing normal appearance of the glands. H&E X 200.
Figure 8: Prostate gland of rats received Na-F along with black tea, showing mild hyperplasia of the epithelial lining of glands. H&E X 100

4. Discussion:

Animals having predictive validity to human responses or physiological processes are good models (Giraldi et al., 2004). The basic neural and behavioural mechanisms controlling sexual desire or motivation are similar in rodents and humans, thus a valid reliable model of rodent would be of great utility for studying sexual behaviour (Agmo et al., 2004). In addition, rats were selected as subjects because there are several homologies between human copulatory behaviour and that of rat including the mechanism of penile erection (Pfaus, 1996).

Confirming our previous findings, an intense suppression of all territorial aggression parameters was observed in the current study following exposure to Na-F (El-lethey et al., 2011). Bataineh and Nusier (2006) also reported lowered levels of territorial aggressive responses in Na-F-exposed rats. Fluorosis has been found to attenuate levels of serum testosterone in rats and mice; the hormone being accountable for modulating male aggression (Huang et al., 2007; Reddy et al., 2007). Strong evidence suggested that aggression increases with a corresponding elevation in testosterone levels (Simpson, 2001). Aggression has also been shown to depend upon the characteristics of the opponent "opponent effect", which include olfactory characteristics (Guillot and Chpouthier, 1996). Therefore the propensity of resident male to attack may be explained by differential olfactory recognition and discrimination of the intruder as a stranger through a differential processing cues provided by opponent. Since testosterone has been implicated to influence odour coding, this might elucidate the lowered intensity of olfactory cues with consequent less recognition of the Na-F-treated intruders, and finally decreased confrontation aggression and defensive behaviour displayed by the resident.

The alleviating effect of black tea on suppressed aggressive parameters observed with Na-F might be explained on the basis of the anti-oxidant capacity of black tea. This property has a significant contribution for limitation of body exposure to Na-F with subsequent control of its effects and manifestations to mimic the level noted with Na-F-free rats (Gardner et al., 2007).

Enhanced lateralization and boxing bouts observed in black tea-supplemented individuals in the current study indicated increased levels of testosterone hormone. Further proof derived from previous studies for Zhou et al. (2003) and Ratnasooriya and Fernando (2008), where administration of black tea was accompanied by elevated testosterone levels.

Here, a marked inhibition of all parameters of sexual behaviour were noted for Na-F-ingested rats in terms of prolongation of mounts, intromissions and ejaculations latencies and reduction in frequencies of the same parameters, along with increased post-ejaculation intervals. These findings are in agreement with earlier studies with Na-F-exposed rats (Bataineh and Nusier, 2006; Bera et al., 2007; El-lethey et al., 2011). Again, this diminution in expression of sexual behaviour might be attributable to Na-F-inflicted reduction in androgen biosynthesis through occurrence of oxidative stress-generated testicular disorders (Ghosh et al., 2002). Furthermore, an increased oxidative stress may result in a complete derangement of the nitric oxide (NO) bioavailability with increment in oxidant generations which in turn, impairs endothelium-dependent vasorelaxation (Ferri et al., 2006; Deanfield et al., 2007). This disruption in NO mechanism needed for induction of vasodilatation and relaxation of penile corpus carvenosum might be accountable for impaired copulatory performance following Na-F exposure.

Since sexual performance was affected here by overall oxidative stress status of individuals. Administration of black tea, with the highest antioxidant potency, along with Na-F resulted in great improvement in all parameters of male sex behaviour. This outcome points out for the first time to the potential impact of black tea in alleviating Na-F-induced sexual dysfunction.

Interestingly, black tea possesses aphrodisiac tendency, where remarkable shortening of mounts and intromissions latencies along with increased frequencies were observed in our black tea-supplemented rats. These indices are indicators for sexual arousability, motivation and vigor (Ratnasooriya and Dharmasiri, 2000; Yakubu et al., 2007). Comparable results derived from former study with rats (Ratnasooriya and Fernando, 2008). These observations with black tea attest to the role that androgen plays as a key factor in sexual behaviour (Schiavi et al., 1997). Polyphenols also significantly increase endothelium-dependent vasodilatation through enhancing NO activity in vascular endothelial cells (Leikert et al., 2002; Deanfield et al., 2007). With respect to tea, both black and green teas have been reported to restore endothelial function through increasing endothelial NO activity in various animal and human studies (Duffy et al., 2001; Anter et al., 2004; Jochmann et al., 2008; Grassi et al., 2008). In particular, theaflavins from black tea have been shown in human studies to favorably affect endothelial function, thus helping to maintain healthy circulation (Stangl et al., 2007). Thus, the vasorelaxation effect favored by black tea might

directly influence penile erection and facilitate copulatory performance shown in the current study. The increase in blood flow to the testes also stimulates testosterone production and secretion, which in turn acts on the central nervous system and gonadal tissues to modulate male sexual behaviour (Wang et al., 1983). Improvement of sex performance could be also attributable, at least partly, to the anxiolytic activity of black tea providing a state of physical relaxation which makes the body more receptive to sensations (Ratnasooriya and Fernando, 2007). Further, black tea contains theanine (Modder and Amarakoon, 2002), which is known to suppress anxiety (Lu et al., 2004; Ozeki et al., 2006; Kimura et al., 2007).

Impairment of male rats' fertility after ingestion of Na-F has been proven in the present study. Fluoride-treated group exhibited the lowest numbers of impregnations, implantations and viable fetuses together with the highest numbers for resorptions. These results are consistent with former studies with rats and mice (Elbetieha et al., 2000; Bataineh and Nusier, 2006; El-lethey et al., 2011). Further support for reduced fertility derived from the remarkable regression in weights of male sex organs evidently shown by Na-F in the presented study. Similar outcomes were reported in rats by Gupta et al. (2007) and El-lethey et al. (2011).

Defective sperm function is the most prevalent cause of male infertility and is difficult to treat (Hull et al., 1985). Oxidative stress status-generated reactive oxygen species (ROS) has been implicated in the poor sperm function and infertility (Sikka, 1996). Oxidative stress down regulates the steroidogenic activity leading to altered testicular function (Maneesh et al., 2005a). 25-40% of infertile men had high levels of ROS in semen samples. When spermatogenesis is impaired, spermatozoa are thought to be immature and functionally defective (Thomas et al., 1997). Mammalian spermatozoa are very sensitive to free radicals-induced damage, mediated by lipid peroxidation, as they are rich in polyunsaturated fatty acids (Agarwal et al., 1994; Maneesh and Jayalekshmi, 2006). ROS attack results in a decreased sperm motility and viability along with increased mid piece morphological defects with deleterious effects on sperm capacity (Lenzi et al., 1993). Furthermore, ROS-induced DNA damage accelerates the germ cell apoptosis (Maneesh et al., 2005b). Unfortunately, limited endogenous mechanisms exist to reverse these damages induced by excessive ROS, where spermatozoa lack the cytoplasmic enzymes required to accomplish the repair (Maneesh and Jayalekshmi, 2006). This is one of the features that make spermatozoa unique in their susceptibility to oxidative insult (Krausz et al., 1994).

Hence, treatment strategies must be directed toward continuous inactivation and lowering of ROS levels to keep only a small amount necessary to maintain normal cell function. Supporting this notion, current ingestion of black tea had a high protective role against testicular oxidative stress and steroidogenic dysfunction induced by Na-F. This defensive effect was namely reflected in augmented fertility parameters and weights of male reproductive organs. Researches have reported that using antioxidants can protect sperm DNA from free radicals and increase blood testis barrier stability (Wolff et al., 1991; Palmeira et al., 2001). Flavonoids such as quercetin present in black tea could affect sperm quality (Taepongsorat et al., 2008; Duen˜as et al., 2010). This trend was also encouraged by other studies, where green tea protects the testicular function, acting against sperm morphology changes in rats (Kang et al., 2000; El-Shahat et al., 2009).

Changes in testicular lipid profile were strongly correlated to testicular degeneration (Chowdhury et al. 1990). These changes were also associated with increased lipids, DNA oxidative damage and depletion of lipid-soluble antioxidants (Lucesoli and Fraga 1995). Both animal and human studies have provided evidence that tea polyphenols modulates lipid metabolism through reduction of triglycerols, inhibition of fat accumulation and enhancement of energy expenditure (Murase et al., 2002; Nagao et al., 2005; Matsuyama et al., 2008; Grove and Lambert, 2010). Moreover, theaflavins-enriched black tea has been reported to possess a unique lipid-lowering property through inhibition of a key enzyme in the pathway of cholesterol synthesis (Leung et al., 2001). Therefore, it seems reasonable that the impact of black tea on lipid profile might also make a significant contribution against Na-F-inflicted testicular disorders.

Finally, our histopathological investigations revealed prominent degenerative changes in seminiferous tubules as represented by severe disorganization and denudation of germinal epithelium along with complete absence of sperms in the lumina confirming the altered testicular function presently observed with Na-F. Moreover, severe hyperplastic changes in booth seminal vesicle and prostate gland were also shown to further verify abolished fertility detected next to Na-F. These findings are consistent with our former study with rats (El-lethey et al., 2011). Further support derived from Tiwari and Pande (2009) where Na-F treatment has been reported to entail damaging effect on testicular histoarchitecture along with disfigured tubular structure accompanied by histological changes in other organs viz. epididymis, vas deferns, seminal vesicle and prostate gland. The structural

changes observed in the testicular tissues could be attributable to Na-F-dampened spermatogenesis and steroidogenesis in the testes as a result of oxidative stress-generated large amount of reactive free radicals oxygen species (Chinoy and Sharma, 1998; Pusphalatha et al., 2005; Ge et al., 2006). This damage might also be enlightened by Na-F-induced vascular insuffiency as discussed earlier.

Combined treatment of black tea along with Na-F significantly ameliorated the histological alterations in testicular tissues, currently provoked by fluoride alone. This was proved by normal appearance of germinal epithelium and sperms in the seminiferous tubules. The ameliorating effect of black tea currently shown might be clarified on the basis of its antioxidant properties formerly proved in animal models and human (Erba et al., 2003; Henning et al., 2004; Satoh et al., 2005; Ojo et al., 2007).

Concluding, in view of the results obtained, drinking black tea definitely has a beneficial influence in impeding Na-F-induced reproductive toxicity in rats. Further, our animal study provides some scientific support to the anecdotal belief that black tea enhances male sexual competence, acquiring marked aphrodisiac activity. However, more researches in support of this insight are still solicited. This research has important insinuations, particularly in developing countries where incidence of fluorosis and ease of use of black tea subsist.

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Sustainability of livelihoods through Urban Agriculture: Gender dimensions in Accra, Ghana

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Abstract: This paper examines the sustainability of livelihoods through Urban Agriculture: Gender dimensions in Accra, Ghana. The population used for the study was the vegetable producers within and around Accra, Ghana. A mix of sampling techniques was followed in choosing UA producers. While a random sampling technique was employed in choosing male UA producers, all female producers who were willing to be interviewed were chosen. In all, 92 male producers and 8 female producers gave consistent responses that were analyzed. The results show that the mean age for male producers is 39.4 years. Female producers are more elderly with a mean age of 49.8 years. The mean year of schooling is 6.4 years for male producers and 7.1years for female producers. While all the households are involved in irrigated farming, only 13% male and 25 % female managed farms practiced irrigated farming alone. The majority of the male and female farmers indicated that high contribution of urban agriculture to their livelihoods. Farm size and access to credit were significant determinants of income from urban agriculture among the respondents.

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Introduction

The modernization of West Africa since colonial rule has attracted large numbers of people from rural to urban areas. In Ghana, despite persistent economic growth, food insecurity and unemployment remain pressing problems in the country and in many parts of Africa (UN Habitat, 2006; Mougeot, 2005), especially in and around the major urban centres (Satterthwaite, 1999). Urban statistics from the Food and Agriculture Organisation (FAO, 2001; 2004) estimate that approximately 800 million people are unable to obtain an adequate and secure supply of food year round. The FAO (2002) suggest about 33% of people in sub-Saharan Africa is undernourished and United Nations (United Nations, 2005; UN-Habitat, 2006) reports that the percentage of urban residents in Sub-Saharan Africa is expected to rise from 39.7 to 53.5% between 2005 and 2030. This will bring new and severe challenges for assuring household food security and access to basic services (Klemesu, 2000; Haddad *et al.*, 1998).Against this backdrop, urban agriculture (UA), or food production conducted in or around urban regions, seems to provide a realistic and pragmatic solution (Mougeot, 2001; 2005; Pothukuchi and Kaufman, 1999). For example, reports indicate that urban agriculture is an important source of food throughout developing-country food systems and a critical food security strategy for poor urban households (Mougeot, 2000; Nugent, 2000; Klemesu and Maxwell, 2000). Urban agriculture may improve household nutrition as it provides a source of fresh, locally grown crops that increase the micronutrients in poor households' diets (Maxwell, 2001; FAO, 2001) and it can increase household incomes (see Smit, 1996; Sanyal, 1985; Sabates *et al.*, 2001; Henn, 2002; IFPRI, 2002). Urban agriculture has been defined in various ways by different organizations (UNDP, 1996; FAO-COAG, 1999; Rabinovitch et al., 1997). According to Nugent (1997), urban agriculture is defined as food production occurring within the confines of cities. It uses resources, products and services found in and around the urban area and often supplies resources, products and services to that area. This production takes place in backyards, rooftops, community vegetables, fruit gardens and unused or public spaces. There are two major categories of urban agriculture in Accra: backyard gardening and open space farming. Backyard gardening takes place in and around homes (estimated to bout 50-70ha distributed over 80,000 tiny backyards) (Obuobie et al., 2006). Open-space farming in Accra is estimated to take place on about 680 ha are under maize, 47ha under vegetables (rain fed) and 251 ha under mixed cereal-vegetable systems. Of this, irrigated vegetable production is extended to 100 ha in the dry season. (Obuobie et al., 2006). The estimated 1000 vegetable farmers produce exotic vegetables, like lettuce, cabbage, spring onions, cucumber, green pepper and cauliflower, or the more traditional vegetables as

tomatoes, okra, eggplant (aubergine) and hot pepper. Plot sizes range between 0.01-0.02 ha per farmer, and reach 20 ha in periurban areas. (Obuobie et al., 2006) Other components of urban and periurban agriculture in Accra are livestock, poultry, floriculture and mushroom.

The incorporation of gender considerations in urban farming is increasing and indeed there have been advances over the last decade in the understanding of both men and women experiences with family in the cities-around the world. There is a move away from the so called 'urban farmer' an undifferentiated masculine, normalized urban dweller who engaged in agriculture. Instead, there is greater recognition that people's experiences with urban agriculture cannot be easily standardized and that gender neutrality does not necessarily capture the breadth of such experiences (Feldstein et al., 1989). According to Woroniuk et al (1997), gender as analytical category is meant to capture the complex set of social processes that are inextricable linked with power relations. Gender is the socially constructed roles and relationship between men and women in a given culture or location and the societal structures that support them. To understand the role that gender plays in urban vegetable production in Ghana, a pilot appraisal was conducted among vegetable farmers and traders in Obuobie et al., 2006 reported that in Accra, Kumasi, Tamale and Takoradi most vegetable retailers are women, while open-space farmers in the cities are often in 9 of 10 cases men. In peri-urban areas and urban household backyard gardening, on the other hand, the situation can be different. Studying gender and urban agriculture in Ghana, Danso et al. (2004) pointed that 1) Farming and non-farming households in Accra had divers socio-economic characteristics, access to productive resources is not gender biased as about 70% of land used in the urban area of Accra belong to the government in which case access depend on lobbying strategies and Males dominate urban farming because of the arduous nature, of the work whereas women dominate marketing because marketing appears to be profitable with less risk. Several studies have document the practice of UA, and lack details and analysis of outcomes of the practices (Mougeot, 1999).Further, only few studies have attempted to consider the gender concerns in UA particularly in Africa. In addition, gender issues in UA is linked with the livelihood framework and examines the welfare impact of UA. With the persistence of the observed gender differences in Accra, absence of empirical facts of the livelihood outcomes makes it difficult to incorporate gender concerns into UA policy and programming agendas. To explore the interaction between gender, UA and sustainable livelihoods among practitioners, the DFID livelihood framework was modified for use in this study. The livelihood approach focuses on people's lives rather than on resources or defined project outputs. The application of livelihood approach in UA will focus on the income generating activities within an UA enterprise and the diversification of these activities (production, marketing and both) as determined by the quantities and quality of assets available to them, risks implication of different options and as affected by the institutional regulatory framework within the social system where they operate.

Materials and Methods

This study was carried out in Accra, the administrative and economic capital of Ghana. It is located in the southern part of Ghana. Mega-Accra has a population of 2,909,643 according to the 2000 population and housing census Accra lies in the coastal savannah zone with low annual rainfall averaging 810mm. Irrigated vegetable production takes place in and around the city. Major sites for the production of vegetables are La, Dzorwulu, Marine Drive and Korle-bu (Obuobie et al.,2006).These areas account for about 135 ha representing 83% of the cultivated irrigated vegetable area in Accra. The population used for the study was the vegetable producers within and around Accra, Ghana. A mix of sampling techniques was followed in choosing UA producers. While a random sampling technique was employed in choosing male UA producers, all female producers who were willing to be interviewed were chosen. In all, 92 male producers and 8 female producers gave consistent responses that were analyzed. Primary data sources were used for this study. The instrument for collecting the data were structured questionnaires, administered by trained enumerators. The data collected included the socio-economic characteristics of UA producers. These included characteristics such as gender, family size, educational status, age of household head, primary occupation, marital status and farming experience. Farm characteristics collected included irrigation facility, land ownership, farm size and type of crops grown. Additional information was obtained on access to assets and decision making on UA outcomes. The data collected for this study were analyzed using descriptive statistics to summarize the socio-economic characteristics of farm households, (which include age, educational levels, sex, family size amongst others), and for farm characteristics such as (farm size, labor use, land ownership etc.) and also for roles of both male and female farmers.

The T-test was employed to test for difference in the level of significance between male and female practitioners of UA. Cost and returns analysis show the profitability of UA producers. A regression analysis was conducted using the Ordinary Least Square (OLS) estimation procedure to isolate the factors that affect the income made from urban agriculture. These factors are the household socio-economic characteristics and asset endowment, farm characteristics and institutional factors .Factors hypothesized in this study are the farmer's age, years of schooling, household size, farm size, number of extension visit, access to credit, membership of farmer's cooperative or social associations and accessibility to water.

Results

The results from the study were organized and presented in tables as follows. Table 1presents livelihood activities of producers, Table 2, number of extension visits per year, Table 3 access to household assets used in productive activities, Table 4 farm assets of UA producers and Table 5 mean values of cost of inputs used per farm of UA producers. Others are Table 6 showing total labour used in standard-days, Table 7, cost and revenue of UA producers per year in US $, Table 8 food security status among male and female farmers, Table 9 human capital development and empowerment among UA producers, while Table 10 and 11 presented farm asset acquisition and improvement from UA income and determinants of income from UA respectively.

Table 1: Livelihood activities of producers

	Male		Female	
Livelihood activities	Frequency	Percentage	Frequency	Percentage
Irrigated vegetable farming only	12	13.0	2	25
Rainfed and irrigated vegetable farming	20	21.7	-	-
Artisan and irrigated vegetable farming	10	10.8	1	12.5
Trading and irrigated vegetable farming	38	41.3	3	37.5
Civil service and irrigated vegetable farming	4	4.3	-	-
Studying and irrigated vegetable farming	7	7.6	2	25
Total	92	100	8	100

Table 2: Number of Extension Visits Per Year

Number	Male		Female	
	Frequency	Percentage	Frequency	Percentage
None	52	56.5	4	50
1	6	6.5	1	12.5
2	14	15.3	1	12.5
3	5	5.4	0	-
>4	15	16.3	2	25
Total	92	100	8	100

Table 3: Access to household assets used in productive activities

Household Assets	Household assets of UA producers		Household assets used for UA	
	Male	Female	Male	Female
Telephone	57 (61.9%)	3 (37.5%)	29 (31.5%)	2 (25%)
Car	1 (1.0%)	-	1 (1.0%)	-
Bicycle	35 (38.0%)	-	14 (15.2%)	-
Rain tank	3 (3.2%)	2 (25%)	-	-
Livestock	1 (1.0%)	-	-	-
Total number of households	92	8	92	8

Figures in parentheses are in percentages

Table 4: Farm assets of UA producers

Farm assets	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Hoes	87	94.5	7	87.5
Cutlass	79	85.8	8	100
Shovel	30	32.6	-	-
Pickaxe	13	14.1	-	-
Watering can	77	83.7	2	25
Sprayer	29	31.5	1	12.5
Water pump	4	4.3	-	-
Rake	19	20.6	1	12.5

Table 5: Mean values of cost of inputs used per farm of UA producers

Inputs	Male	Female	T-statistics
Seeds($)			
Lettuce	36.7	31.1	3.5 (0.006)
Cabbage	27.0	-	-
Spring Onions	65.1	-	-
Chemical($)			
Herbicide	74.5	-	-
Pesticide	11.8	8.1	5.7 (0.001)
Fungicide	44.8	11.7	22.9 (0.001)
NPK	11.9	5.8	8.9 (0.001)
Urea	9.1	3.0	-
Manure	20.1	5.2	-
Labour(Std)	120.9	105.1	2.4(0.020)

Table 6: Total labour used in standard-days

Farm Activity	Farm	Male		Female		Children	
	Manager	Number	Mean(Std days)	Number	Mean(Stddays)	Number	Mean(Std days)
Land clearing	24	24	30.7	2	15.7	3	9
Land prep.	24	22	20.9	1	27	-	-
Nursery	2.4	4	4.2	-	-	-	-
Sowing	9	3	39	-	-	-	-
Transplanting	3.4	14	32.1	-	-	-	-
Thinning	7.3	-	-	-	-	-	-
Weeding	17	15	36.8	1	18	-	-
Irrigation	4	3	57.5	-	-	-	-
Fert. appl.	4	-	-	-	-	-	-
Pest control	4.8	2	10.5	-	-	-	-
Harvesting	10.7	-	-	-	-	-	-

Table 7: Cost and revenue of UA producers per year in US $

	Male Managed Farm			Female Managed Farm		
	Total Cost	Total Revenue	Gross Margin	Total Cost	Total Revenue	Gross margin
Per farm	222	763	540	113	470	356
Per hectare	435	1,496	1,061	471	1,958	1,487

Table 8: Food security status among male and female farmers

Number of food deficit days	Male		Female	
	Before UA	After UA	Before UA	After UA
None	48	55	3	5
1	15	24	-	2
2	17	15	5	1
3	12	-	-	-

Table 9: Human capital development and empowerment among UA Producers

Indicator	Male		Female	
	Before	After	Before	After
Pay school fees	11(12)	59(64)	2(25)	8(100)
Send children for higher education	-	9(10)	-	3(38)
Pay for health services	29(32)	77(84)	3(38)	7(88)
Join more social associations	3(2)	4(4)	1(13)	5(63)
Participate in community development activities	9(10)	25(27)	2(25)	4(50)
Start another business	-	-	1(13)	-
Feel more respected	13(14)	38(41)	-	-

Figures in parenthesis are percentages

Table 10: Farm asset acquisition and improvement from UA income

Type of Asset	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Bought additional hoes	68	73.91	7	87.5
Bought additional cutlass	52	56.52	5	62.5
Bought additional shovel	17	18.48	-	-
Bought additional pick axe	9	9.78	-	-
Bought additional watering can	55	59.78	1	12.5
Bought additional Knapsack sprayer	21	22.83	-	-
Dug well	3	3.26	-	-

Table 11: Determinants of income from UA

Variables	Coefficient	Standard Error
Constant	5.568***	0.465
Age of farm manager	0.007	0.005
Years of schooling of farm manager	0.003	0.019
Gender	0.079	0.316
Household size	-0.020	0.046
Farm size	0.746***	0.192
Number of extension visit	-0.043	0.033
Access to credit	2.083**	0.844
Membership of farmer's association	0.067	0.177
R^2 = 0.469		
F ratio =3.038 ***		

Discussion

Socio-economic and Demographic Characteristics of Producers

About 92% of market-oriented vegetable producers were males while 8% were females. This reflects the dominance of men in vegetable production in Ghana. Similar finding were reported by Obuobie et al. (2006). According to key informants, this pattern is due more to the culture of the people where men are expected to bring food home. Besides, it is believed that vegetable production demands more physical strength that men can provide. The age distribution reveals that about 30% of male producers were within the age range of 41 and 50 years which represents the highest percentage. The mean age for male producers is 39.4 years. Female producers are more elderly with a mean age of 49.8 years and with the highest percentage within the age range of 41 and 50. This shows that vegetable production is carried out mostly by young men in their economically active years. It revealed that while the highest percentage of male

producers do not have more than three years of formal education, female producers have more years of schooling. The mean year of schooling is 6.4 years for male producers and 7.1years for female producers. Although the years of schooling were not significantly different, about 14% of male and 12% of female producers have no formal schooling while only one of the male producers spent over 12 years in school. The result shows that the highly educated do not participate in urban vegetable production. Obosu-Mensah (1999), Danso et al, (2002), Keraita, (2002) and Ladapo and Oladele (2011) reported that 23% of urban farmers interviewed lack formal education, a greater number had primary (33%) or secondary (37%) education while 6% had tertiary education. They concluded that people of all educational backgrounds are involved in urban farming in Accra Also, results on the demographic characteristics of the producers shows that 75% of managers of male managed farms and 67% of female managed farms are married. There is none that is single in female managed farms. It means that young unmarried women do not find it an attractive option as a livelihood activity. However, among male producers, there are singles. The household sizes are larger among the female managed farms.This may be due to the fact that the female farmers are older and have more children. About 50% of female managed farms and 38% of male managed farms have household size between 5 to 8 children. Only 2.3% of male headed farms have household size beyond 8. About 39% of male farmers and 62% of female farmers have over 12 years of experience. Generally, the farmers are well experienced. Almost half of male producers and and two-thirds of the female producers belonged to farmers cooperative association). It shows that the number outside the association is large among male producers. The most common reason given for non-participation is that they cannot identify benefits derived from it. More farmers need to be encouraged to join the farmers' association for effective and coordinated efforts to influence their productive activities and also policy.

Household Livelihood Activities

Table 1 shows other livelihood activities engaged in by the various farm households. While all the households are involved in irrigated farming, only 13% male and 25 % female managed farms practiced irrigated farming alone. Others combined it with rainfed farming and also trading. It should be noted that artisans, students and civil servants also practiced irrigated vegetable production. This shows that vegetable production is an important source of income to a large variety of households. While few depend on it solely, it supplements income for the larger group. Among male and female farmers, the highest number combined vegetable production with trading.

Access to Credit and Extension Visits

The main source of capital for 99% and 100% of male and female producers respectively; is personal. Only 1% of male producers obtain credit from money lenders and Esusu/ROSCAS. None of the producers obtained credit from formal sources. Limited financial resources have negative implication for the commercialization of UA and economies of scale. About half of all the farmers irrespective of gender were not visited by extension agents in a year. However, it is interesting to note that about 25% of female and 16% of male producers were visited for at least four times in a year. This shows that although, extension agents visit some farms irrespective of gender, they are a select few. An expanded programme that caters for all is required to increase productivity and income of farmers.

Asset endowment and control by UA producers

Table 3 shows the asset endowments of households of producers and those employed in UA. Assets such as telephone are higher among male producers. None of the household of female producers has means of transport such as car and bicycle. Only 1% of male producers have livestock while none of the female producers have. The asset endowments of these producers reveal that the proportions of male and female farmers that have access to household assets for UA are less than those than own these assets. Only four of these assets are used in their productive activities, these are telephone, car and bicycles and land. These are required for transportation, access to information and land for cultivation. Only two women have access to telephone for their activities while none can access car, vehicle and land. While the numbers of those who use household assets are few, female producers fare worse.

In households of male managed farm, decisions on the use of telephone, car and bicycle is taken by men. In households of female managed farms, decisions are taken by the women with respect to the use of telephones only. .In general, joint decisions are not common in these households. It is clear that in households of female managed farms, women have more bargaining power and are active in decision making than in households of male managed farms. Table 5 shows farmers access to farm assets and it reveals that irrespective of gender, farmers have the needed basic implements for cultivation. Female

managed farms lack capital intensive farm assets like water pump and sprayer. Inadequate capital by these female farmers explains their inability to purchase these assets. In male managed farm households, the percentage of men with control on telephone, car and bicycle are 69.8%,100% and 69.2% while the others are jointly controlled for the married. It shows that assets that can be used for communication and transportation are mostly controlled by men in these households. In female managed farm household, all the farmers have control over telephones only.

Male farmers cultivated a wider variety of crops as compared to women. Crops cultivated by male farmers include lettuce, cabbage, spring onions. Others on smaller scale are cucumber, cauliflower, sweet pepper, okro and maize. Female farmers cultivated lettuce and okro. Occasionally, they also cultivate pepper. Both cultivate lettuce while only male managed farms cultivate cabbage and spring onions. This shows difference in cropping mix and crop diversification. Farmers explained that the difference in cropping is due to the labour requirement and the fact that it is strenuous cultivating those crops. Moreover, since female rely on hired labor for many of the tasks, it will require more capital to cultivate those crops. They have therefore limited themselves to few crops which their resource endowments can successfully cultivate. It should also be noted that while male managed farms have between 2 to 3 plots, female managed farms have only one plot. This also reduces their ability to diversify. There are no cultural constraints to the type of crops cultivated by gender; the main constraint is the farm manager's asset endowments.

Resource-use levels of UA producers

Irrespective of the crop mix, as revealed in table 6, both male and female producers used all inputs except herbicide. Herbicide is used by male managed farms to overcome weeds in addition to manual weeding but female use manual weeding only. It is clear that the resource-use per farm of male managed farms is significantly higher than those of female managed farms. This is so because of the difference in farm sizes. Although, farmers have scattered plots, the mean farm size is 0.51ha for male and 0.24ha for female. The total labor used by farms includes family and hired labor. The division of tasks according to gender is presented in table 6. Almost all farm operations are carried out by men in both male and female managed farms in addition to the farm manager. In female farms, land clearing, land preparation and weeding is done by few women while only one of the female farmers uses children for land clearing. None of the producers employ adult female or children for their farm operations. Irrigation is the most labor intensive task and is mainly carried out by men, even on female managed farms.

The economics of vegetable production shows the gross margin per farm in table 7. The costs and revenue per farm and per hectare for male differs from that of female farmers. The total cost of production and revenue per farm is higher on male managed farms while it is the opposite on the per hectare basis.. The difference in gross margin per farm is by 34 percent and is significant at t=1.979(0.061).However, on the per hectare basis, the difference is by 29 percent with the female managed farms having higher gross margin which is significantly different at t=1.825(0.099). This reveals that female managed farms are as profitable as male managed farms.The difference in their gross margin is due to the scale of their operation. It should be noted that only 8 farms are female managed. Although not disaggregated, Zigah (2005); states that an average farmer obtains about 447 US $ as the net margin after the dry season and Drechsel et al(2006) stated that the net revenue per farm per year is between 400-800 US $.

The decision on the use of income from UA vegetable is taken mostly by the male farmers themselves, which represent 92% of our sample. The female farmers that are married agreed that they consult their husbands at the different stages of farm production and therefore also involve them in deciding on the income. It should be noted that 75% of the female farmers are married while others are widowed. It is therefore reasonable to believe that in view of the cultural setting in Ghana, the female farmers will take decisions jointly with their husbands while the widowed take decisions on their own. Figures on Table 8 show that the number of households with food deficit days per week reduced after engaging in urban vegetable production. This is observed in households of both male and female vegetable producers. It is understandable that some households have food deficit days because of the many channels of expenditure of these farmers. However, none of the households have more than two food deficit days in a week. In all, it reveals that UA has enhanced availability, accessibility and sustainability of food in the households of practitioners.

Table 9 shows that among male producers, the highest percentage increase was recorded for farmers who improved on school fees payment and payment for health care services. UA also increased the number of those that participate in community development. In all, a greater number became

empowered. For female producers, a similar pattern was observed (Table 10). In addition, more female farmers joined social associations. Engaging in urban vegetable production improves their human and social capital. While the degree differs, it is important that an increasing number are improving their welfare. As shown in table 11, a large percentage was able to increase their farm assets from the income from their UA productive activities. Essentially, they have invested in the purchase of additional farm implements like hoes, cutlasses and watering cans. This is similar for both male and female managed farms. On male managed farms, about one-fifth purchased knapsack sprayer and shovel while 3.26% dug well. None of the female-managed farm was able to do this because of the capital outlay required for these items. However, it is notable that income from UA enabled some farmers to acquire such capital intensive items and improved on their farm activities.

Impact of contribution of UA income to household income

The income made from UA is influenced by factors such as the household socio-economic characteristics and asset endowment, farm characteristics and institutional factors .Factors hypothesized in this study are the farmer's age, years of schooling, household size, farm size, number of extension visit, access to credit, membership of farmer's cooperative or social associations and accessibility to water. The table 12 reveals that all the hypothesized variables have positive relationship with amount of income from UA except household size and number of extension visit. However, the two variables are not significant. A possible reason for this is that the size of farm manager's household does not affect the supply of labor to the farm. Farmers essentially use their own labor and hired labour. Also, the number of extension visits do not account for the quality of extension services rendered which may have more implication on farmer's income. The positive sign reveal that a unit increase in any of these variables will increase income by the size of the coefficient. Only farm size and access to credit were significant. It means to increase income from vegetable production, farm sizes need to be increased and efforts should be made to increase farmer's access to production credit.

Further analysis was conducted to examine the proportion of income from UA to household income. For all producers, the mean proportion is 0.81.This reveals that about 80% of the incomes of households of sampled farms come from UA. The importance of UA in their livelihood is also emphasized by the fact that 71% of all producers explained that their main source of livelihood is UA while other activities are minor. Disaggregating by gender, the mean proportion is 0.82 and 0.78 for male and female producers respectively. This shows that irrespective of gender, UA is the main livelihood activity and major source of income into the households of the sampled producers. This underscores the importance of UA in the livelihood of urban farmers. The incorporation of gender considerations in urban farming is increasing and indeed there have been advances over the last decade in the understanding of both men and women experiences with family in the cities-around the world In Accra, the pattern of gender involvement shows that male producers are younger and less educated than female producers. While all the households are involved in irrigated farming, the proportion of male managed farm is low to female managed farms practicing irrigated farming alone. The majority of the male and female farmers indicated that high contribution of urban agriculture to their livelihoods. Farm size and access to credit were significant determinants of income from urban agriculture among the respondents. It is important that policy recommendations on urban agriculture should take into cognizance these significant variables in order to ensure that the needs of producers are met.

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Karyological investigation of Persian Gulf cuttle fish (*sepia arabica*) in the coasts of Khuzestan province

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Abstract: Cephalopods are a group of Molluska. Which have extensive geographical extension and variation, in the world's oceans the most important cephalopods in Persian Gulf and Oman Sea are squids and cuttle fish? Nowadays we have found that cuttle fish has an extensive application in several contexts. But there is not enough information about their biology and the amount of their storage in Iran's waters. We must considerate reservoirs more than ever. Because of its economic value and the amount cattle fish's hunting. Therefore in this research for the first time in the world, cattle fish of Persian Gulf was investigated Kariologicaly. Investigation results of metaphase plaques resultant from analyzing blood cells of cuttle fish showed that , this species has the chromosomal number of 2n=68 indeed it is found than in chromosomal extension of this species there were not identifiable sexual chromosomes. **[Ashraf Jazayeri**, Kariologicaly investigation of Persian Gulf cuttle fish (*sepia arabica*) in the coasts of Khuzestan province. Life Science Journal. 2011; 8(2):849-852] (ISSN: 1097-8135). http://www.lifesciencesite.com.

Keywords: kariology, cattle fish, Persian Gulf, sepia Arabica

1. Introduction

Cephalopods are old animals and successful groups of Molluska. These animals live in all of the world's oceans and in various depth of the water. Generally cephalopods have 2 side symmetry are with an extended head with a crown of mobile process which surrounded the mouth. Some of them do not have a shell and some others have. Shell is covered by a cloak. Cephalopods are animals with soft body which discharge water from cloak' s hole with a funnel flush, and so in addition to repelling the wastes, make the animal to move. Their body color is so various. they can rapidly change their color and get the color of surroundings. Comparing to fish, these animals release fewer amounts of eggs in the water. Their egg's diameter is various from 0.8 to 17 mm. The total number of known species of cephalopods in the world is 1000 variety and they belong to 43 families. There are only sexes of *Sepiidae* family in Iran waters. *Sepiidae* family is known with a flat big internal shell made from carbonate at the exterior part which is contributed to animal floating control. Most important cephalopods in Persian Gulf and Oman Sea are squids and cuttle fish. Which are spreaded frequently in coastal waters and far from coast of this zone? Dominant species of cuttle fish in south waters of our country is sepia *pharaonis.*

Fig1. Sepia Arabica (cuttle fish)

***Sepia arabica* (cuttle fish) classification:**

Kingdom: Animalia
Phylum: Molluska
Class: Cephalopoda
Super order: Decapodiformes
Order: Sepiida
Family: Sepiidae
Spices: sepia arabica

sepia arabica (cuttle fish) in the world is spreaded in Indian ocean , red sea , Adan Gulf , Persian Gulf , Giboty countries , Egypt , Eritrea ,

India , Iran , Kuwait , Pakistan , Oman , Qatar , Saudi Arabia , Somalia , Srilanka , Sudan , Yemen , Emirates. Today it is found that cuttle fish have various applications in several fields. In spite of this, there is not enough information for their biology and the amount of their storage in Iran waters. Based on the last obtained information from Iran fishery, a kilogram of cuttle fish is exported with the price of about 3.4 dollars .By exporting cuttle fish in the year 2007, 3 million dollars of currency has been entered to the country. This aquatic has a valuable place among fishery products as an important export product .considering the biological and economical importance of this marine source the necessity of its biological and geographical investigation in Persian Gulf and investigation some of its characteristics especially from view point of chromosomal investigations, is very important.

2. Material and Methods

In this investigation a research ship with motor power of 280 horse power, equipped with trawler net .sampling was performed monthly during a year from Mar.2007 until Feb.2008, in hunting place (Bahrekan). Samples were transferred to laboratory alive in a plate which had enough air. For preparing desired chromosomal extensions, two methods were used which include blood cell' s analysis and preparing a slide from metaphasic gill tissue (after injecting kolchesin). In the first method environmental blood analysis was like this: immediately after hunting, animal' s cloak was cut and some blood is extracted from main heart and animal's gill hearts with an injector mixed with sodium heparin for carrying blood samples. A special refrigerator for carrying laboratory samples was used. After arriving laboratory, samples were frizzed in 4^{0} c. for analyzing blood cells a RPM1 1640 tissue culture was used. About 10 drops of serum and 0.1 cc of PHA was added to analysis environment (as a mitogen) and then the amount of 1cc of heparins blood was added to each analysis vial (all of the above stages were perfumed in sterilized environment) .

Then analysis environments were kept in incubator with 25 ^{0}c for 4 days, and they were shaking slowly every 24 hours.

After 72 hours, cells extraction from analysis environment was perfumed. In such a way that tissue culture contents were transferred to centrifuge pipe and were centrifuge for 6 minutes by 1000 g, and surface solution was removed. Then 3 ml of hypotonic solution was added slowly to cell mass by shaking (used hypotonic solution was potassium chloride 0.75 molar). Pipes were kept in laboratory

Fig2. Sampling the blood from heart of cuttle fish

temperature for 20 minutes and were centrifuged for 6 minutes with 1000 g and again surface layer was removed. Then by adding fresh and cold fixative, the last step of centrifuge was performed and again surface layer was removed. Some drops of fixative added to final residual, and were combined perfectly this residual was used for producing microscopically slide. For preparing extension no the slide, the dropping droplet method was used on clean and cold glasses (From 50 cm away). Then prepared slides were staining with Gimsa 1% in dry weather of laboratory. In microscopic studies, after observing adequate metaphasic plaques, desired chromosomal expiations were photographed by a microscope equipped with a camera.

In second method, after transferring a live sample to the laboratory, the sample is weighted rapidly and 0.02 ml kolchesin solution was injected to muscle peritoneal area by an insulin injector per a gram of body weight. Then the sample was kept in aquarium for 5 hours, sample was analyzed , and gills and kidney tissue was separated .after pressing the tissues , they were poured to vials and 0.36% of potassium chloride hypotonic solution was added to it (as same volume as applied tissue) and was kept in room temperature for 45 minutes . In the next stage, fresh and cold fixative was added it in the amount of one third of solution volume (ratio 3:1 Ethanol to acetic acid). Then first stage of centrifuge was performed f0r 10 minutes with 1000 g. After supernatant layer was removed and fixative was added to bottom residual, again, it was incubated for 1 hour in room temperature. And washing stages were performed two times. Finally 1 ml of fixative was added to the residual and getting lam and staining was perfumed like previous stage.

3. Results

Results of Karyological investigations on this species showed that, the chromosomal number of sepia Arabica species is 2n= 68 which includes 3 pairs of met centric, 14 pairs of sub Meta centric and 17 pairs of Telo centric. Indeed it is not observed any identifiable sexual chromosomes.

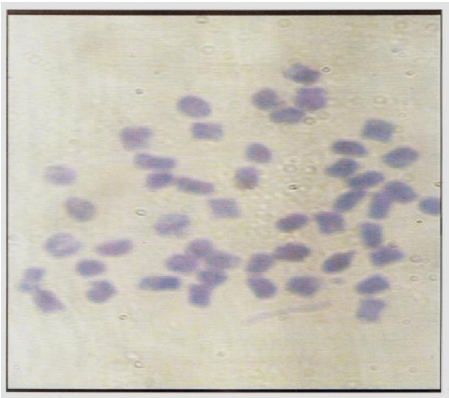

Figure.3. Metaphasic chromosomal expantion of sepia arabica

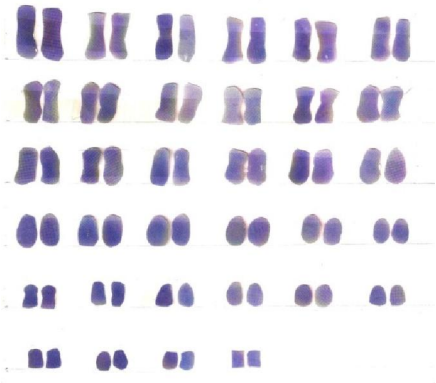

Fig4. Karyotype of sepia arabica

4. Discussion

Philogenetic studies on the basis of recognizing mitochondria and core genome help a lot to classify organisms such as cephalopods. In this study which is perfumed for the first time on sepia Arabica species, number of chromosomes were investigated and counted and identified. chromosomal number of this species is 2n= 68 ,which is different comparing to the number of the chromosomes of other species of Persian gulf cuttle fish *sepia pharaonis* (2n=48) .So far chromosomal number was reported for those groups of Molluska which their numbers in cephalopods are more than the other cephalopods .Also in cephalopods, chromosomal number was reported to be between 52-112 .Which is different from chromosomal number in the other Molluska .Notilus species shows the least chromosomal number between cephalopods ,Maybe this is the singe of an inheritance attribute for cephalopods . In the other research 3 groups of cephalopods were investigated considering the number of chromosomes. (Inaba 1985), Results showed that there was a diploid situation in some of them, for example chromosomal numbers 52 and 56. Also in the other research (Inaba 2007) on octopus was showed (octopus *vulgaris*). Besides obtaining chromosomal number of 2n= 56 for this species. It is stated that there were not any sexual chromosomes for males.

However variation in aquatics, chromosomal numbers can have several reasons such as external fecundation and occurring the polyploidy phenomenon. It seems that it is necessary to have more studies specially on the DNA molecule level to enable us have judgment about genomic change of various species of aquatics from invertebrates to vertebrates .There for , Molluska can be very great examples for extensive genetic researches because they have some unique characteristics.

Today by performing exact researches and using new technique in molecular genetic studies it is tried to review the animals, classic classifications based on cladestic measures and correct if necessary. So it is evident that it needs basic studies about genomic identifying of aquatic species.

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Effect of Self awareness Education on the Self efficacy and Sociotropy Autonomy Characteristics of Nurses in a Psychiatry Clinic

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Abstract: To be a part of the therapy in the patients' surroundings, nurses need to know about patient's behaviors, needs, feelings, and ways to define these behaviors. However, to obtain information on patient, nurses particularly need to be aware of themselves and understand the effects they have on their surroundings. This study was aimed to investigate the effect of self awareness education on the self efficacy and sociotropy autonomy characteristics of nurses in a psychiatric inpatient clinic at Zagazig University Hospitals. The sample was composed of 19 nurses who on the job. Three tools were used for data collection: nurses characteristics data form, self efficacy scale, and sociotropy autonomy scale. The study result indicated that the psychiatric nurses self efficacy was improved at post educational program, a significant difference was observed between the pre-test and post-test mean scores for the total nurses autonomy and total nurses sociotropy ($P<0.05$). However the mean score of total Sociotropy autonomy didn't differ significantly at pre and post educational program ($P=0.488$), and a highly significant correlation was present between total of self efficacy and total of sociotropy autonomy at pre and post educational program ($P<0.05$). It was concluded that self awareness education program had a positive effect on the development of self efficacy and sociotropy autonomy characteristics of nurses in a psychiatric clinic. It is recommended that, self awareness education should be applied as continuing education for nurses working in psychiatry clinics and further studies should be carried out with bigger and different sample groups, along with control groups.
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Key words: Nurses, Psychiatry Clinic, Self awareness, Self efficacy, Sociotropy Autonomy.

1. Introduction:

Working with people with mental illness is very challenging and Nurses who work in a psychiatric setting can have a significant impact on the mental status of their patients (Willetts & Leff, 2003).

The quality of care nurses provide in a psychiatric setting is related to their skill of using themselves therapeutically in the setting and their ability to show empathy and listen effectively. It is, therefore, very essential that the psychiatry clinics should meet the professional standards of self efficacy and autonomy as determined by the American Nurses Association (ANA) to execute an effective nursing practice. These standards can possibly be achieved by improving several individual characteristics, such as self awareness and ability to give and accept feedback to and from others, as claimed essential for psychiatry nurses by ANA (Maccalum, 2002 & Melrose, 2002).

Self awareness means the discovery of different paths in relationships and life. Forming and maintaining healthy relationships can be promoted as long as individuals are mutually aware of their thoughts, feelings, and behaviors. (Rohrer, 2002). Self awareness education can be given to health professionals with clinical supervision. The most commonly used method to increase self awareness in a clinical setting is group discussion (Taylor, 1990). The professional psychiatric nurse is aware of the need for ongoing mentorship to achieve increasing levels of mastery of psychiatric nursing practice. Clinical supervision not only reviews one's clinical care but also functions as a support system for the professional psychiatric nurse. (Jack & Smith, 2007).

The development of professional standards of psychiatric nursing also includes participants' self awareness of the use of professional autonomy. For psychiatric nursing, attaining autonomy means being able to define the domain of nursing and being able to exercise control over psychiatric nursing practice. This idea of shaping destiny, rather than letting outside forces is in control, views power as a positive force that allows nurses to attain goals. Autonomy is one of the primary elements of professionalism (Babadağ, 2001).

Autonomy has two major interrelated components. The first one is control over nursing tasks, and the second one is participation in decision making. This second component is particularly problematic for nursing because it requires some nursing conditions such as awareness of self and desire to improve professional performance. (Maccalum, 2002 & Melrose, 2002).

Autonomous individuals are conceptualized as individuals who have excessive personal demands for accomplishment and control. Autonomy is considered to be a combination of beliefs, behavioral dispositions, and attitudes that draw an individual to invest in oneself for one's own uniqueness, mastery over one's bodily functioning, and control over one's environment (Wynd, 2003). In contrast, sociotropy is considered to be a combination of beliefs, behavioral dispositions, and attitudes that draw an individual to attend to and depend on others for personal satisfaction. Highly sociotropic individuals are characterized as emphasizing interpersonal interactions involving relatedness, intimacy, empathy, approval, affection, protection, guidance, and help .Also Sociotropic individuals are conceptualized as having an interest in being loved, approved, esteemed, and praised by others significantly to maintain positive self-image (Şahin & Ulusoy, 2003 ;Sato & McCann, 2007). This means that psychiatric nurses should have self efficacy for increasing the quality of care that achieves these standards (Adams & Miller, 2001; Babadağ, 2001; Potter & Perry, 2005).

McCabe (2000) stated that, the self can be used therapeutically to develop the patient's trust and to promote a sense of wellbeing. By increasing our self awareness we can be more effective in our personal and professional lives. It is, therefore, essential that the psychiatry clinics should meet the professional standards of self efficacy and autonomy to develop an effective nursing practice.

Self efficacy is defined as Perceived concern with people's belief in their capabilities to mobilize the motivation, cognitive resources, and courses of action needed to exercise control over given events (Bandura *et al.,* 1999). Self-efficacy is one of the cognitive factors that influence a person's behaviors and the judgment and belief that one can do a specific behavior in a successful manner (Esra and Olcay, 2009). The study finding by Chye et al., (1997) revealed that self-efficacy of nurses was associated with high performance. Nonetheless, other studies have shown that the self efficacy perception level of nurses can increase through appropriate education methods implemented to nurses, motivation, and positive feedback (Nicoll & Butler, 1996).

Group interaction is a process in which individuals are influenced by each other, receive approval from others, and interact positively, in other words, a process in which their sociotropic characteristics develop (Bieling *et al.,* 2000 & Bagby *et al.,* 2001). Group interaction is at the same time a necessary condition for the development of autonomy and self efficacy in individuals. Within this process, individuals might need to change their emotional, cognitive, and behavioral patterns (Mrayyan, 2005). On the basis of this information, it could be concluded that attempts of increasing self awareness of nurses through group interaction might lead to a more satisfactory and quality care service by influencing the individual characteristics of nurses such as self efficacy, autonomy, and sociotropy.

Continuing education for nurses has been determined to be effective in their development of positive attitudes and helpful in making nurses feel more effective and adequate and in making them act accordingly. Also the self efficacy and sociotropy autonomy characteristics of psychiatric nurses can be changed through a systematically planned education (Ryan & Deci, 2000 & Tanaka *et al.,* 2002). On the basis of this viewpoint, this research was aimed for examining the effect of a self awareness education program on the development of self efficacy and sociotropy autonomy characteristics of nurses in a psychiatric clinic.

The study aim:

The aim of this study was to investigate the effect of self awareness education program on the self efficacy and sociotropy autonomy characteristics of nurses in a psychiatry clinic.

2. Subjects and Methods

Research Hypotheses:

Self efficacy and sociotropy autonomy characteristics of psychiatric nurses can be widen through a self awareness education.

Research Design

A one-group before–after Quasi-experimental design was used to achieve the study aim.

Setting

This study was conducted in a psychiatry inpatient clinic at Zagazig University Hospitals. It has a capacity of 30 beds and provides educational and therapeutic services and training in the field of psychiatry.

Sample

All nurses available in the previous mentioned setting, no age limit, all educational level available was selected for this study (19 psychiatric staff nurses on the job).

Tools for Data Collection

Data was collected by using:

1- Nurses Characteristics Data Form

Nurses' Descriptive Characteristics Data Form A 15-item form developed by the researcher was used to collect data about the nurses' socio-demographic characteristics (age, marital status, residence) and professional characteristics and information that could be reflected in their perceptions (Years of experience ; educational level; Status of satisfaction with current place of work; Status of finding nursing profession appropriate for oneself; Status of considering quitting work on psychiatric ward; Opinion about effectiveness of professional practice; Opinion about patients' appraisal of their care; Opinion about their coworkers' appraisal of their care; Opinion about their supervisors' appraisal of their care; Participation in activities for the professional; Participation in decisions given by team about patients; and Having goals related to professional future).

2- Self Efficacy Scale (SES)

This tool was developed by Jerusalem & Schwarzer (1992). It was created to assess general sense of perceived self efficacy with the aim in mind to predict coping with daily hassles as well as adaptation after experiencing all kinds of stressful life events. It has acceptable Cronbach alpha values for scale reliability (internal consistency value of .81 and test–retest reliability of .92). Self efficacy scale has 21 items in a 4-point Likert-type scale with scores that can be as Good (63-84), as Moderate (42-<63), and as Weak (21-<42).

3- Sociotropy Autonomy Scale (SAS)

This tool was developed by Beck *et al.*(1983), It has acceptable coefficient alpha values for scale reliability ,the internal consistency value for sociotropy was ranged between .89 and .94 and that for autonomy between .83 and .95 Bieling *et al.* (2000). The tool contains 27 items about sociotropy and 28 items about autonomy for a total of 55 items in a 5-point Likert-type scale. A high sociotropy score points to a high sociotropy personality characteristic. A high autonomy score shows an autonomy personality characteristic at a high level.

Procedure

- A consent to conduct the study was taking from the hospital director, the researchers contacted to the staff nurse to explain the purpose and procedure of the study and determine the available time to demonstrate the educational session (twice /week for 1 week).
- The study tools was distributed to the staff nurse in the presence of the researchers to collect pre-assessment data related to nurses characteristics data form, self efficacy scale and sociotropy autonomy scales for 2 weeks twice /week.
- Ten sessions distributed on 15 weeks twice /week , it were provided for available staff nurses , each session was from 30 to 45 minutes
- Each session had its own title and objective according to its content.

-The contents of the educational program were prepared using pre assessment data and textbooks and psychiatric nurses' performance standards that had been defined in the literature. The self awareness education program consisted of the following subjects: introduction to awareness, anxiety, trust, dependence, flexibility, loneliness, helplessness, loss, anger, guilt, and power. (Beck *et al.,* 1984; Stuart, 1998; Pugliesi, 1999; Nezlek, 2002; Rohrer, 2002 & Sheldon & Bettencourt, 2002).

-The objectives of the education program were as follows:

1. To raise nurses' self awareness of their own feelings, thoughts, and attitudes while working with patients with psychiatric illness (to increase autonomy)
2. To comment on patient care of nurses working in psychiatric settings (to increase self efficacy).
3. To increase the development of characteristics of adequacy and sufficiency in nurses working in psychiatric settings (to increase self efficacy).
4. To promote the development of common solutions to work-related problems by nurses working in a psychiatric setting: exchanging their feelings and thoughts with others working in different environments and receiving feedback from them (to increase sociotropic characteristics).

- post assessment was done through distribution the study tools to the staff nurse in the presence of the researchers to collect post assessment data related to self efficacy scale and sociotropy autonomy scale for 2 weeks twice /week.
- Data collection lasted for 22 weeks which started from March to August 2010.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 13. For

quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more was done using Chi-square test (X2). For comparison between means of two groups before and after the conduction of a designed program, paired t-test was used. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p<0.05$ for interpretation of results of tests of significance. (Petrie and Sabin, 2005)

Limitations of the Study

- Small size of the sample and no control group are the main limitations of this study
- Not being able to apply the program to all samples at the same time as a result of the distribution of nurses throughout the day.

3. Results:

Table (1) revealed that, the studied sample ages ranged from 19 to 53 years, with mean age (33.95±11.91) and their years of experience ranged from 1 to 35 years. More than half of them (52.6%) had a technical institute of nursing, 63.2% were a rural residency, and about two third of them were married (68.4%).

Majority of the studied sample not considering quitting work on psychiatric ward, in the same time they were not participate in activities for the professional development (89.5% and 73.7% respectively). More than half of the studied sample were somewhat satisfied with the current place of work, and had a natural opinion about their coworkers' appraisal of their care (52.6% and 57.9% respectively). About two third of the studied sample revealed that she is somewhat finding nursing profession appropriate for oneself (63.2%), participated in decisions given by team about patients (68.4%), had nursing professional goals related to future (68.4%), and had a natural opinion about their supervisors' appraisal of their work (68.4%).

It could be concluded that, the studied sample had a positive professional perception and that they made every effort for their professional development.

Table (2) shows the difference between the pre-test and post-test of total nurses self efficacy mean scores ,it highly differ significantly at pre and post intervention program ($p=0.001$). Figure (1) illustrated that, the psychiatric nurses self efficacy was improved at post educational program.

Table (3) shows that a significant difference was observed between the pre-test and post-test mean scores for the total nurses autonomy ($P<0.05$) and total nurses sociotropy ($P<0.05$). However the mean score of total Sociotropy autonomy didn't differ significantly at pre and post educational program ($P=0.488$). Figure (2) demonstrated that total Sociotropy–autonomy scores didn't differ at pre and post educational program.

Table (4) revealed that, a highly significant correlation was present between total of self efficacy and total of sociotropy autonomy at pre and post educational program ($P<0.05$). Figure (3,4 and 5) revealed that, there was a significant positive correlation between nurses self efficacy and sociotropy autonomy at pre educational program. Figure (6,7 and 8) revealed that, there was a significant positive correlation between nurses self efficacy and sociotropy autonomy at post educational program.

Table (1): Distribution of the psychiatric nurses' professional characteristics and perception of the profession (n=19).

Variables	The studied psychiatric nurses (n=19)	
	NO	%
Age (Years):		
Range	19-53	
Mean±SD	33.95±11.91	
Median	32.00	
Education:		
Nursing diploma	7	36.9
Technical institute of nursing	10	52.6
Baccalaureate degree	2	10.5
Postgraduate degree	0	0
Marital status:		
Married	13	68.4
Single	3	15.8
Widowed	3	15.8
Divorced	0	0
Residence:		
Urban	7	36.8
Rural	12	63.2
Years of experience		
Range	1-35	
Mean±SD	13.58±13.72	
Median	9.00	

Table (1) con.: Distribution of the psychiatric nurses' professional characteristics and perception of the profession (n=19).

Variables	The studied psychiatric nurses (n=19)	
	N	%
Status of Satisfaction with current place of work:		
Satisfied	7	36.8
Somewhat satisfied	10	52.6
Unsatisfied	2	10.5
Status of finding nursing profession appropriate for oneself:		
Appropriate	7	36.8
Somewhat appropriate	12	63.2
Not appropriate	0	0
Considering quitting work on psychiatric ward:		
Considering quitting	2	10.5
Not considering quitting	17	89.5
Opinion about effectiveness of professional practice:		
Good	7	36.8
Neither good nor bad	8	42.1
Bad	4	21.1
Opinion about patients' appraisal of their care		
Positive	7	36.8
Neither positive nor negative	8	42.1
Negative	4	21.1
Opinion about their coworkers' appraisal of their care:		
Positive	4	21.1
Neither positive nor negative	11	57.9
Negative	4	21.1
Opinion about their supervisors' appraisal of their care:		
Positive	4	21.1
Neither positive nor negative	13	68.4
Negative	2	10.5
Participation in activities for the professional development:		
Yes	5	26.3
No	14	73.7
Participation in decisions given by team about patients:		
Participate	13	68.4
Don't participate	6	31.6
Having goals related to nursing professional future:		
Has professional goals	13	68.4
Doesn't have professional goals	6	31.6

Table (2): Distribution of the psychiatric nurses' self efficacy score at pre and post educational program.

Self Efficacy items	The studied psychiatric nurses (n=19)				X2 P
	Pre-program		Post-program		
	N	%	N	%	
Good (63-84)	1	5.3	11	57.9	19.40 0.0001*
Moderate (42-<63)	7	36.8	8	42.1	
Weak (21-<42)	11	57.9	0	0	
Range	37-66		60-72		
Mean±SD	42.00±6.84		65.47±4.40		
Median	40.00		64.00		
Paired t-test	11.327				
P	0.0001*				

*Significant (P<0.05)

Figure (1): Level of Self efficacy in the studied psychiatric nurses at pre and post educational program.

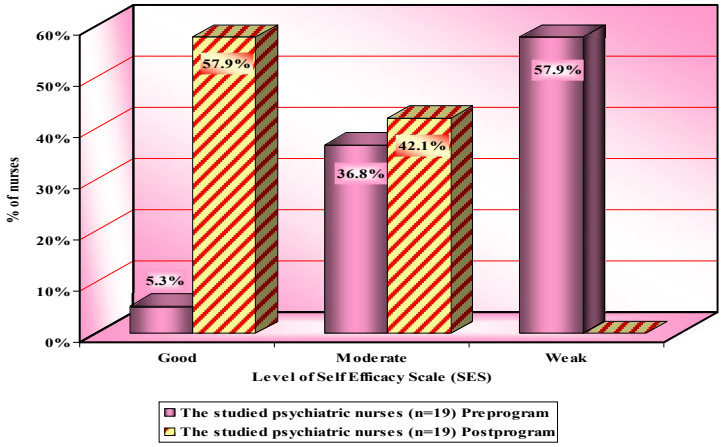


Table (3): Distribution of the psychiatric nurses Sociotropy Autonomy scores at pre and post educational program.

Sociotropy-Autonomy items	The studied psychiatric nurses (n=19)		Paired t-test	P
	Pre-program	Post-program		
	Range Mean±SD	Range Mean±SD		
Sociotropy items: A-Fear of criticism and rejection	24-43 38.95±5.80	23-33 26.68±4.95	9.110	0.0001*
B-Preference for affiliation	16.26 24.42±3.48	15-21 17.53±2.43	9.066	0.0001*
Total Sociotropy	**41-69** **63.37±9.15**	**38-54** **44.21±7.36**	**9.208**	**0.0001***
Autonomy items: A-Independent Goal Attainment	14-20 15.31±2.13	19-20 19.84±0.37	7.884	0.0001*
B-Sociotropy items	6-8 6.31±0.75	8-8 8.00±0.00	9.798	0.0001*
C-Sensitivity to Others' Control	24-42 29.53±5.89	40-42 41.05±0.40	8.569	0.0001*
Total Autonomy	**45-70** **51.16±8.50**	**68-70** **68.89±0.56**	**8.724**	**0.0001***
Total sociotropy-autonomy	**109-119** **114.53±2.85**	**106-123** **113.10±7.37**	**0.708**	**0.488**

*Significant (P<0.05)

Figure (2): Mean score of Sociotropy-Autonomy of the studied psychiatric nurses at pre and post educational program.

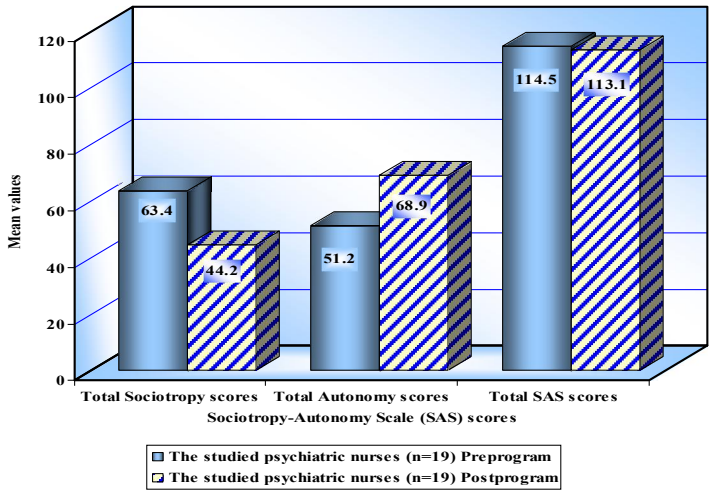


Table (4): Correlation between Self efficacy scale (SES) and Sociotropy Autonomy Scale (SAS) of the studied psychiatric nurses at pre and post educational program.

Sociotropy-Autonomy Scale (SAS)	Self efficacy scale (SES) of the studied psychiatric nurses (n=19)			
	Pre-program		Post-program	
	R	P	R	P
Sociotropy items:				
A-Fear of criticism and rejection	-0.736	0.001*	0.934	0.0001*
B-Preference for affiliation	-0.696	0.001*	0.888	0.0001*
Total Sociotropy	**-0.703**	**0.001***	**0.924**	**0.0001***
Autonomy items:				
A-Independent Goal Attainment	0.671	0.002*	0.692	0.001*
B-Sociotropy items	0.672	0.002*	-	-
C-Sensitivity to Others' Control	0.678	0.001*	-0.545	0.016*
Total Autonomy	**0.691**	**0.001***	**0.372**	**0.117**
Total SAS	**-0.542**	**0.017***	**0.901**	**0.0001***

*Significant (P<0.05) r=Correlation coefficient

Figure (3): Correlation between Self efficacy scale (SES) scores and total sociotropy scores among the studied psychiatric nurses at preprogram.

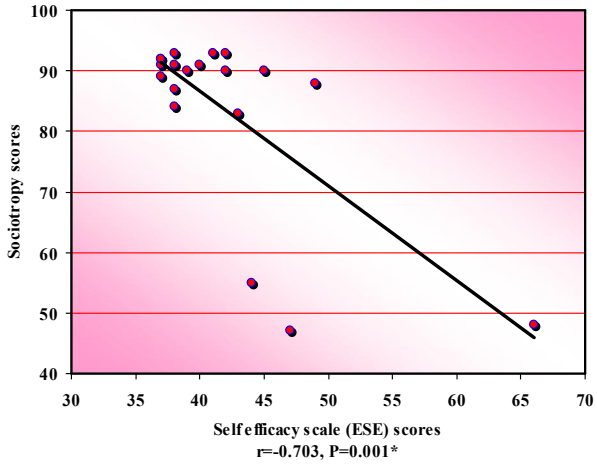


Figure (4): Correlation between Self efficacy scale (SES) scores and total autonomy scores among the studied psychiatric nurses at pre program.

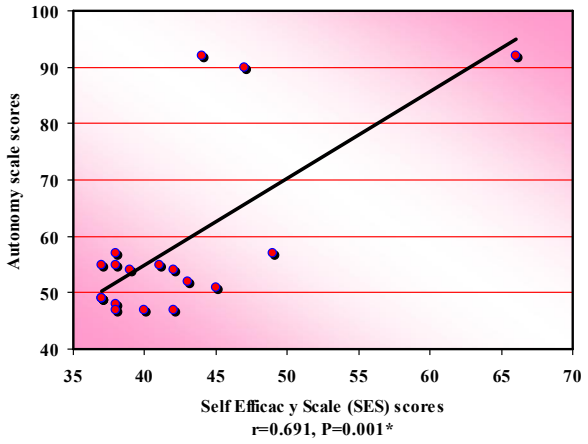


Figure (5): Correlation between Self efficacy scale (SES) scores and total sociotropy-Autonomy scale (SAS) scores among the studied psychiatric nurses at pre program

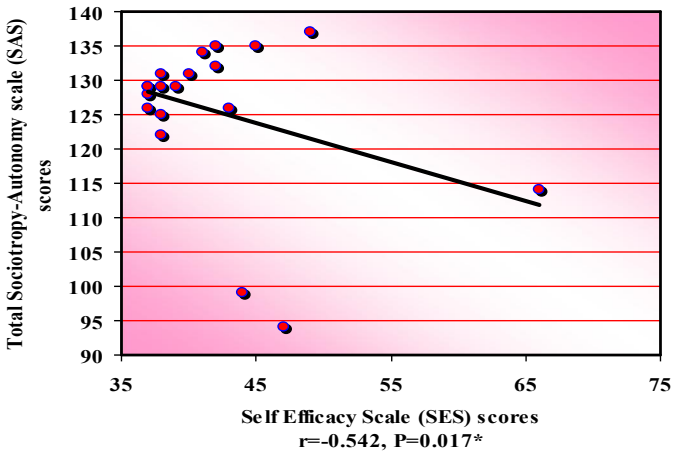


Figure (6): Correlation between Self efficacy scale (SES) scores and total sociotropy scores among the studied psychiatric nurses at post program.

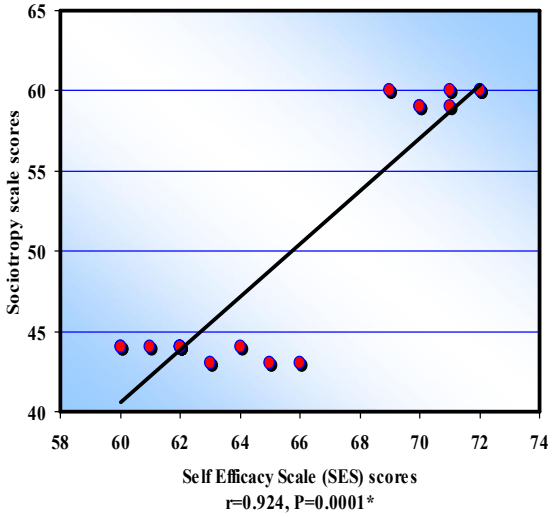


Figure (7): Correlation between Self efficacy scale (SES) scores and total autonomy scores among the studied psychiatric nurses at post program.

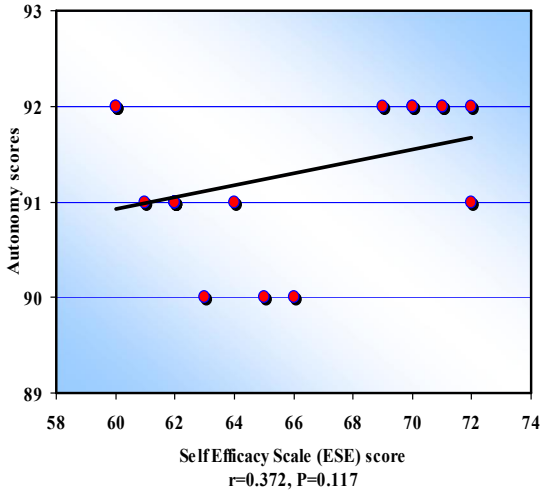
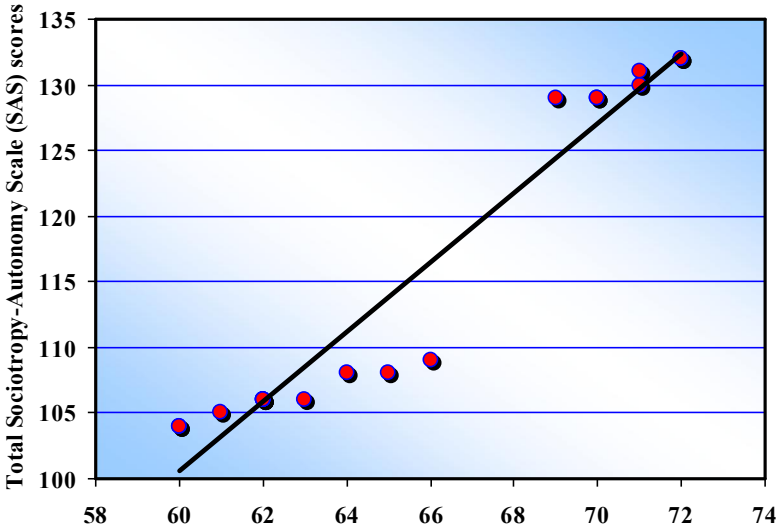


Figure (8): Correlation between Self efficacy scale (SES) scores and total sociotropy Autonomy scale (SAS) scores among the studied psychiatric nurses at post program.



4. Discussion

All health care professionals, such as nurses who work in a psychiatric setting, care for patients through observation by meeting the patients and their families and evaluating individuals' problems, needs, abilities, level of adaptation with their surroundings, and self-concepts. However, to be aware of this information, nurses particularly need to be aware of themselves and understand the effects they have on their surroundings (Esra and Olcay, 2009).

It can be seen that the nurses in the present study are undergoing a productive period. Moreover, it could be concluded that the professional perception of the nurses participating in the research is positive and that they are qualified to make every effort for their professional development.

As displayed in table 2, figure 1, the mean score of total nurses self efficacy scores were highly differ significantly at pre and post intervention program, it is seen that the pre program self-efficacy perception of nurses was ranged from Moderate (36.8%) to Weak(57.9%) level, increased to Good (57.9%) and Moderate (42.1) level after the education was received, despite the data showing that most of the nurses in the sample found their profession appropriate for themselves and felt satisfied while working, this could be interpreted as a lack of feedback and awareness of feelings in nurses while working.

Consistence with this result Schwarzer (1994 & 1996) and Rohrer (2002) found that people who have high levels of self efficacy exhibit more energy at the beginning of an action, and they continue this longer than do those with low self efficacy. When faced with an obstacle, those with high self efficacy group more quickly and continue to work to reach their goals.

On the same line Esra and Olcay (2009) added that, the education had a positive effect on the nurses' self-respect, motivation for success, and ability to control events. According to our best knowledge about self awareness, if we are aware of our emotions, thoughts, and behaviors, we can lead our activities. In addition, in an occupational setting, self efficacy plays a role in how well employees perform their jobs (Schwarzer, 1996; Bandura *et al.,* 1999 & Rohrer, 2002).

On the other hand Dunn *et al.,* (2007) argue that awareness of feelings is especially significant for nurses in psychiatry clinics to cope with feelings such as anger and that it directly affects the self efficacy perception of nurses.

The education program also affected the autonomy of the nurses who participated in the present study that increased after educational program. In addition to the nurses' finding more satisfaction with their work, this situation could be expected to have a positive effect on their relationships with coworkers and patients under their care.

This study results is consistent with self awareness knowledge , Beck's (1987) cognitive theory and Rohrer (2002) who they found that increasing autonomous personal characteristics, along with increasing individuals' feelings of success, was the cause for an increase in motivation to do their work. A highly autonomous person is characterized as emphasizing individuality, self-reliance, personal achievements, and a sense of power to do what one wants.

The present study result indicated that 89.5% of the nurses in the sample stated that they had not considering quitting working in a psychiatry clinic and that they willingly choose their profession . Studies by Adams & Miller(2001); Babadağ(2001) and Kelleci & Gölbaşı (2004) reported the same result and relates it to the self-control and autonomy of these individuals , they assumed that nurses with a high level of autonomy would play a more effective role in meeting the criteria of their profession.

The present study result also demonstrate in table (3) , figure (2) that the level of study sample autonomy was higher than their sociotropic characteristics at post education, it may be related to the study sample positive professional perception. Although the total Sociotropy autonomy scores didn't differ at pre (mean=114.53) and post (mean=113.10) educational program, this result indicated the balanced sociotropy autonomy nurses characteristics that it was expected to be observed in this study for the education program was aimed to increase the ability to give and accept feedback to and from others and to increase sociotropic characteristics , in the same time to increase autonomy. This findings agrees with Sato & McCann (2007) who reported that functional interpersonal styles have balanced sociotropy autonomy characteristics

The study finding revealed that ,there is a highly significant correlation was present between total of self efficacy and total of sociotropy autonomy at pre and post educational program, this may be due to the functional interpersonal styles have balanced sociotropy autonomy characteristics. In addition the working in psychiatric setting required the nurses have a special skills to be autonomous in the same time sharing their feelings in the group by providing feedback about care plan examples of team relationships and helpful attitudes to have with patients and they were willing to have approval of others, and the needs they felt for love and respect in the group were increased, and in this way, their sociotropic personal characteristics increased as well. In this study, this finding supported Beck's (1987) cognitive theory and Esra and Olcay (2009).

Different factors may influence whether group members are willing to provide or accept feedback and the acts of giving or receiving feedback may have different impacts (Marcus, 2006). The major influential factor in our education can be the exchange of emotions and related experiences. The literature also supports our findings on this type of self awareness education method that involves group supervision feedback (Stuart, 1998).

5. Conclusion

On the basis of the findings of this study, it can be concluded that self awareness education program has a positive effect on mounting self efficacy and autonomy personal characteristics in our

sample, and a highly significant correlation was present between total of self efficacy and total of sociotropy autonomy.

6. Recommendation

-Self awareness education should be applied as continuing education for nurses working in psychiatry clinics.

- Further studies should be carried out with bigger and different sample groups, along with control groups.

- Further studies should be carried out to investigate the relationship between self efficacy, work stress and psychiatric nurses' performance.

-The findings of this study would help in developing standards for psychiatric and mental health nursing.

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Effect of Some Production Parameters on Net Wrap Used in Agricultural Products Packaging on the End Use Properties

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Abstract: This research is mainly concerned with designing net wrap used for packaging agricultural products. Twenty seven samples were produced using polyethylene yarns. Warp knitted technique was applied to produce all samples under study using different parameters. Different parameters were studied including, inlay tape thickness 20,25 and 30 micron, inlay tape width 1,1.25 and 1.5 mm ,pillar blades number 99, 101 and 213,treatment with ultra violet and anti static. Many tests were carried out in order to evaluate the net according to the final product needs such as tensile strength and elongation of net and inlay tape and linear meter tests. Some more results were reached concerning structures and materials. The results showed that there is a direct relationship between tensile strength and number of pillar, the more inlay tape width, the higher tensile strength of the sample become, the more inlay tape thickness per unit area the more tensile strength of the sample become, the more number of pillar yarns the lower elongation the samples become, and the higher pillar yarns per unit area the more linier meter weight the sample become.

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Key words: Production Parameters, Net Wrap, Agricultural, Products Packaging End Use Properties

1. Introduction:

Warp knitting is the most versatile fabric production technique in textiles industry, warp knitted fabrics can be produced continuously, elastic or stable, with an open or closed structure, they can be produced flat, tubular or three dimensional .The flexibility of warp knitting techniques makes them attractive both to the designer and the manufacturer of technical textiles[(1).] Knitted fabrics are textile structures assembled from basic construction units called loops. There are two basic technologies for manufacturing. In warp knitted technology every loop in the fabric structure formed from a separate yarn called warp mainly introduced in the linier fabric direction. The most characteristic feature of the warp knitted fabric is that neighboring loops of one course are not created from the same yarn. [(2)] Warp knitting technology enables the individual products to be adapted to suit specific requirements[(3).] Basic warp knitting constructions, can be given as follows[(1)].

1-Elastic structures.
2-Stable structures.
3-Directionally oriented structures.
4-Multi-axial structures.
5-Open structures.
6-Closed structures.
7-Three-dimensional structures.
8-Bi-axial structures.

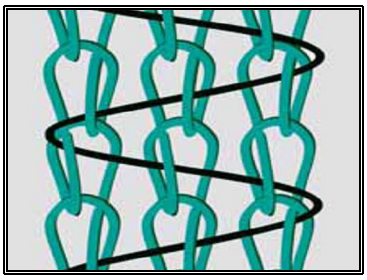

Fig (1) the open warp knitting structures

Mc Murray invented an integrally knitted tubular shaped net structure having first and second parallel knit fabric layers formed on separate parallel spaced front and back needle beds using the same yarn ingredients and knitted identical in fabric construction and yarn runner feed lengths producing a perfect continuously uniform cylindrical shaped tubular blank that can be joined together at one end of the tube by jacquard selected threads being deflected to knit on both front and back needle beds at predetermined joining points in the design. Another Fabrics were produced using circumferentially consecutive portions of one laid-in yarns which are bound in respective spaced chains to stitches aligned in a circumferential or course wise direction, but the consecutive portions of the laid-in yarn are offset in the same wale wise direction which is axial relative to the tube into which the fabric may be expanded in

an approximate helix. The amount of laid –in yarn employed may be varied to suit requirements of mechanical strength or mesh size by varying the number of gaps between adjacent chains. [5]Warp knitting technology can be seen in diverse applications as it offers a wide range of possibilities for producing nets they may have open or dense constructions, and may have fine or coarse structures the net is used to protect persons and buildings during construction. Fishnets are other possible end-uses. Textile nets have a wide range of end uses. One of their main uses is to protect against adverse weather conditions this has led to the development of many new applications, both inside and outside. [3]

Packaging nets (Net Wrap)

Packaging products has always been a major sector of industries; these products are stacked and then secured by wrapping stretch wrap around them. The main issue with this packaging method is that millions of pounds of waste are produced. Some of the other effects include green house gas emissions during its production, limited recycling, and high packaging costs. Net wraps are porous materials designed to shed water and permit greater air flow at the bale surface at less cost than plastic wraps. Like plastic wraps, net wraps can be applied during baling and eliminate the need for twine. Studies comparing yield loss between various storage methods indicate that net wrap is somewhat intermediate between twine-tied outside bales and plastic wrap.

In recent years, new technologies have been developed that attempt to reduce outside storage losses by covering the circumference of product with solid plastic sheeting to shed water. Past research has demonstrated that wrapping the product bale surface with ultraviolet (UV) light-stabilized. [6]

In order to reduce the amounts of stretch wrap used by industries and distribution centers, various other types of packaging materials were developed. There are various reasons for packaging, such as: easing storage and transportation of products, maintaining products together, and preventing products from becoming damaged. This new packaging technology is made of light, but extremely durable polypropylene (PP) or polyethylene (PE) material. Both of these have a good damage resistance to ultra violate (UV) rays. It works like a large plastic cover strapped with strong plastic buckles. With this packaging method, the tension that is created aids to protect and stabilize the load. Due to its reusable nature, it reduces stretch wrap costs, damage claims, waste expenses, plastic stretch wrap by 80-90%, and other shipping wastes. The covers also have the benefit of being easy to handle for operators and it provides personnel with a consistent and uncomplicated method to secure loads.[7] A packaging wrap is also provided for agriculture products, a net can be placed to increase its strength ,the used material that is safe in accordance with packaging regulation and prevents the products from binding with the packaging wrap during the storage .[8] Large package sizes and rapid baling rates minimize labor requirements for baling and transport around the farm (local). However, storage losses of round bales are frequently much greater than those of similar product in smaller rectangular bales. Most of the increased storage loss for product appears to result from storage outside without protection from the weather. Losses during outside storage of twine-tied round bales result from weathering and from moisture movement from. Weathering is visually associated with a change in color and deterioration of the outer layers of product following exposure to rainfall, sunlight, and other factors during storage. Weathered hay suffers substantial losses of both yield and forage quality and is much less palatable to livestock than undamaged product.

Package type and size effects

Agriculture products storage research indicates that the increase in size and densities of round bales increase heat-damaged protein and fiber concentrations compared with rectangular bales, possibly due to restricted heat and moisture exchange. Due to the cylindrical shape of round bales, even a seemingly insignificant layer of weathered material on the bale surface can represent a substantial loss of yield.

Characteristics of the nets used in packaging

Characteristics of the nets used in packaging to suit the end-use are the level of shade provided, or sun-protection factor, the wind permeability, the opacity, the stability, or elasticity, in the lengthwise and crosswise directions .Most of the nets produced on single-bar raschel machines are produced by a pillar stitch-inlay lapping or by other simple basic constructions. The loops in the various lappings can be processed so that they are open or closed. Some of the most frequently used basic lapping. [3]

2. The experimental Work

This research concerns with producing fabrics suitable for net wrap used for packaging agricultural products. In this study 27 samples were produced using polyethylene yarns and warp knitting technique.

Raw Materials Used and Manufacturing Method

All samples under study were produced in fixed width (123 cm) according to the following variables:

Table (1) Variables used to produce samples under study

Property	Group 1			Group 2			Group 3		
No. of Pillar/piece	49			50			51		
Inlay Tape Thickness Mic	20	25	30	20	25	30	20	25	30
Inlay Tape Width (mm)	1	1.25	1.5	1	1.25	1.5	1	1.25	1.5
Pillar-pillar Gap Approx Cm	2.5			2.45			2.4		

Table (2) Specification of the machine used in producing samples under study

Property	Specification
Machine Type	Warp Knitting Machine
Company	Karl Mayer
Model	RS 2 NK-F-ISO ET1
Manufacturing Year	1996
External Apparatus	ISO
Machine Speed	1225 rpm
machine Width	590 cm
No. of Product Pieces	4
No. of Needle Bar	2
No. of guide bar	2
Long Shogging Distance Guide	1

Table (3) Specifications of raw materials used, and ISO Parameters

Property	Specification
Pillar width Film (mm)	645 Double
Inlay width Film (mm)	335 single
Film (Mic.) Pillar thickness	80
Film (Mic.) Inlay thickness	75
Inlay tape thickness (Mic.)	20,25 and 30
Inlay tape width (mm)	1,1.25 and 1.5
Pillar blades Number	201,209 and 213
inlay blades Number	99, 101, and 103
Number of pillar	49,50 and 51
Pillar-pillar Gap Approx (Cm)	2.5,2.45 and 2.4
No.of Pillar /unit area	196,200and 204
No.of Inlay /unit area	200,208and 212
Film Color	Natural
Chemical Treatment	Ultra violet stabilized and Anti static

Tests applied to samples under study

several tests were carried out in order to evaluate the produced fabrics, these are:

1- **Tensile strength & elongation at break** according to ASTM-D 1682 [9]

2- **Weight test**, this test was carried out according to the **ASTM-D 3776- 1979** [10]

Table (4) results of all tests applied to samples produced with pillar yarn 49, pillar Gap Approx 2.5 cm and varieties in the thickness and width of Inlay yarn.

Property	Sample No.								
	1	2	3	4	5	6	7	8	9
Net tensile strength (Kg)	245.4	249.5	256.1	246.1	254.8	255.7	256.9	258.3	259.2
Net Elongation (%)	14.6	14.9	15.4	15.3	15.6	15.9	15.5	16.3	17.1
Inlay Tensile strength (Kg)	5.9	6.4	6.5	6.2	6.4	6.6	6.3	6.6	6.7
Inlay Elongation (%)	53.2	55.1	56.9	54.3	57.6	61.1	58.8	59.6	62.8
Wt / LM (g)	11.3	11.5	11.7	11.6	11.9	12.1	12	12	12.2

Table (5) results of all tests applied to samples produced with pillar yarn 50, pillar Gap Approx Cm 2.45 and varieties in the thickness and width of Inlay yarn.

Property	Sample No.								
	10	11	12	13	14	15	16	17	18
Net tensile strength (Kg)	252.9	256.2	258.5	254.6	258.9	263.3	262.1	269.3	276.6
Net Elongation (%)	11.7	12.3	12.7	12	13.2	13.7	13.1	13.9	14.4
Inlay Tensile strength (Kg)	6.3	6.5	6.8	6.4	6.7	6.9	6.6	6.8	7.1
Inlay Elongation (%)	39.5	42.5	46.3	45.6	48.9	51.2	49.3	52.8	55.6
Wt / LM (g)	12.1	12.1	12.3	12.3	12.4	12.6	12.5	12.7	12.7

Table (6) results of all tests applied to samples produced with pillar yarn 51, pillar Gap Approx Cm 2.4 and varieties in the thickness and width of Inlay yarn.

Property	Sample No.								
	19	20	21	22	23	24	25	26	27
Net tensile strength (Kg)	261.9	263.0	267.8	265.7	269.1	271.4	268.3	278.9	287.1
Net Elongation (%)	9.5	10.2	11.3	10.8	11.5	11.8	11.3	11.9	12.3
Inlay Tensile strength (Kg)	6.8	7	7.2	7.4	7.6	7.7	7.3	7.6	7.8
Inlay Elongation (%)	33.4	35.7	36.1	35	37.6	39.8	39.2	40.5	41.7
Wt / LM (g)	12.2	12.2	12.4	12.5	12.7	12.8	12.6	12.8	13

Result and Discussion

Tensile strength:

It is obvious from figure (1) to (3) that there is a direct relationship between net tensile strength and number of pillar. We can report that, this is because of the increase in number of Pillar means an increase in number of yarns per unit area causing fabrics to be more compacted leading to the increase in fabric tensile strength.

It was also found that the more inlay tape thickness per unit area the more net tensile strength for all the samples become, which means that samples with 30 micron and 20 micron have recorded the highest rates of tensile strength,

It can be seen from the table and figures that the more inlay tape width, the higher tensile strength the samples become. We can report that the increase in this factor increase number of yarns leading the fabric to be more compacted which cause the increase the cutoff durability

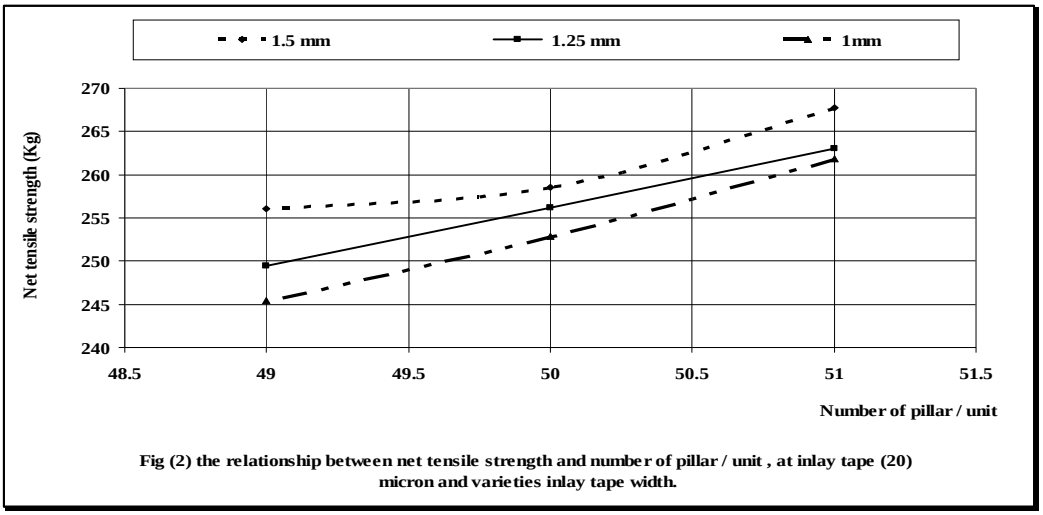

Fig (2) the relationship between net tensile strength and number of pillar / unit , at inlay tape (20) micron and varieties inlay tape width.

Table (7) regression equation and correlation coefficient for the effect of number of pillar on net tensile strength, at inlay tape 20 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =223.5833X + 21.4	0.901024
50	Y = 241.6667X + 11.2	0.989483
51	Y = 249.4833 X + 11.8	0.940266

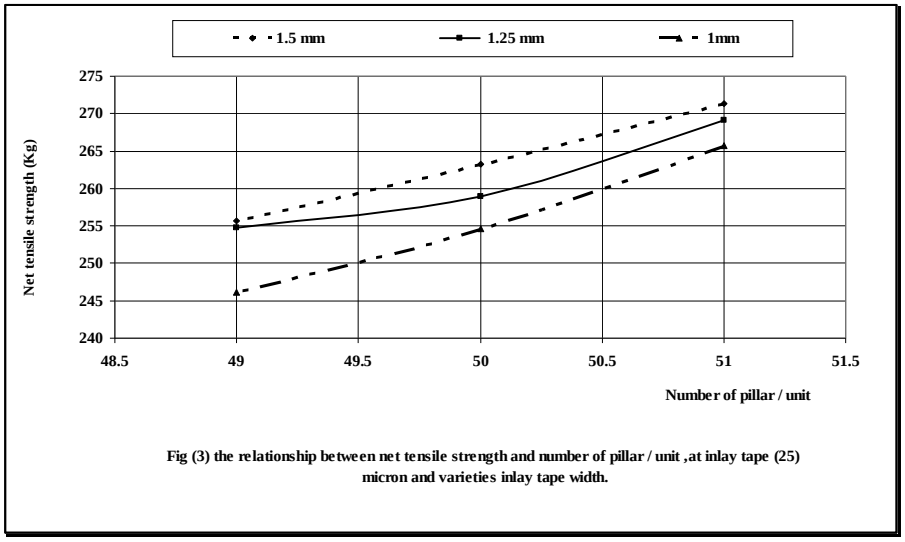

Fig (3) the relationship between net tensile strength and number of pillar / unit ,at inlay tape (25) micron and varieties inlay tape width.

Table (8) regression equation and correlation coefficient for the effect of number of pillar on net tensile strength, at inlay tape 25 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =254.4833X + 11.4	0.99385
50	Y = 237.1833X + 17.4	0.999974
51	Y = 228.2 X + 19.2	0.905338

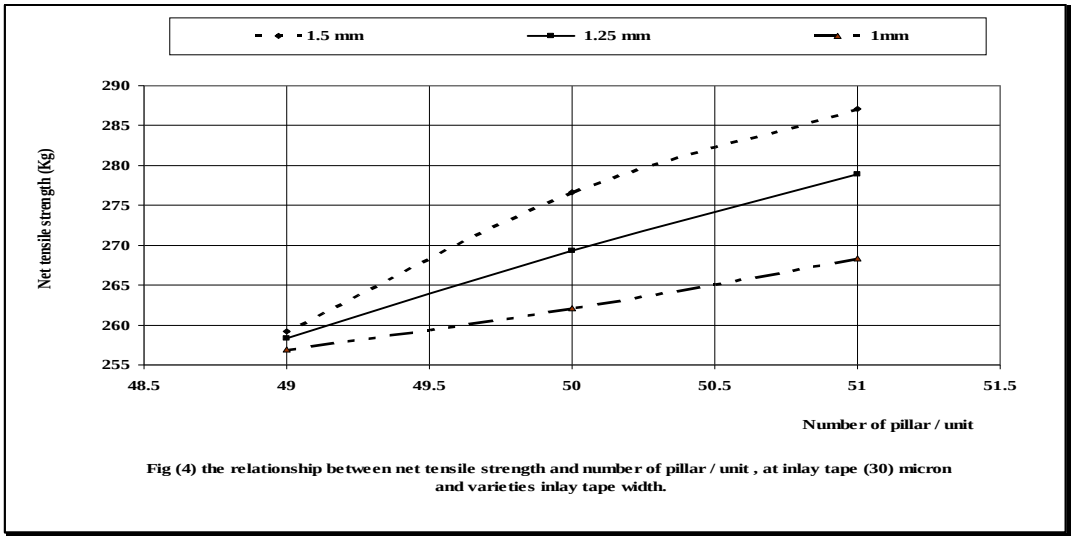

Fig (4) the relationship between net tensile strength and number of pillar / unit , at inlay tape (30) micron and varieties inlay tape width.

Table (9) regression equation and correlation coefficient for the effect of number of pillar on net tensile strength, at inlay tape 30 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =252.3833X + 4.6	0.992215
50	Y = 233.0833X + 29	0.99992
51	Y = 37.6 X + 231.1	0.997295

Elongation at break

It can be seen from tables and figures that the more number of pillar yarns the lower elongation the samples become, and so samples with 49 pillar of piece have recorded the highest rates of elongation whereas samples with 51 ends per piece have

recorded the lowest rates. It is noticed that % elongation at break of the net samples decrease as the number of pillar yarns increases, this is due to more cohesive forces is resulted between yarns.

It is obvious from the statistical analysis that the increase in inlay tape thickness the lowest rates of thickness, whereas samples with 30 micron have recorded the lowest rates. We can report that increase the thickness of inlay tape stress to which cause net to be more compacted leading to the decrease in fabric elongation.

It is obvious from the statically analysis of the elongation results that there are an inverse relationship between inlay tape width and elongation

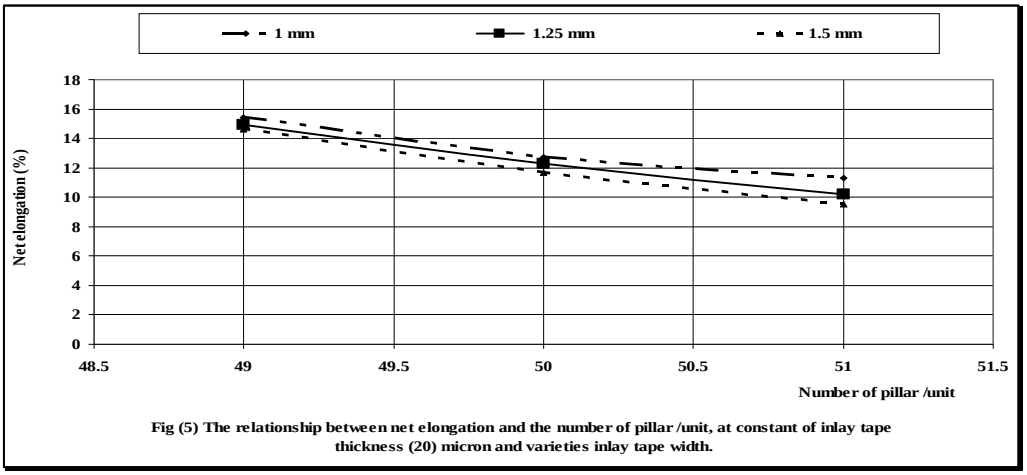

Fig (5) The relationship between net elongation and the number of pillar /unit, at constant of inlay tape thickness (20) micron and varieties inlay tape width.

Table (10) regression equation and correlation coefficient for the effect of number of pillar on net elongation, at inlay tape 20 micron and varieties inlay tape width .

Number of pillar	Regression equation	Correlation coefficient
49	Y =16.7X - 1.3	-0.9285714
50	Y = 14.1X – 1.4	-0.8029550
51	Y =14.2X - 2.9	-0.9226129

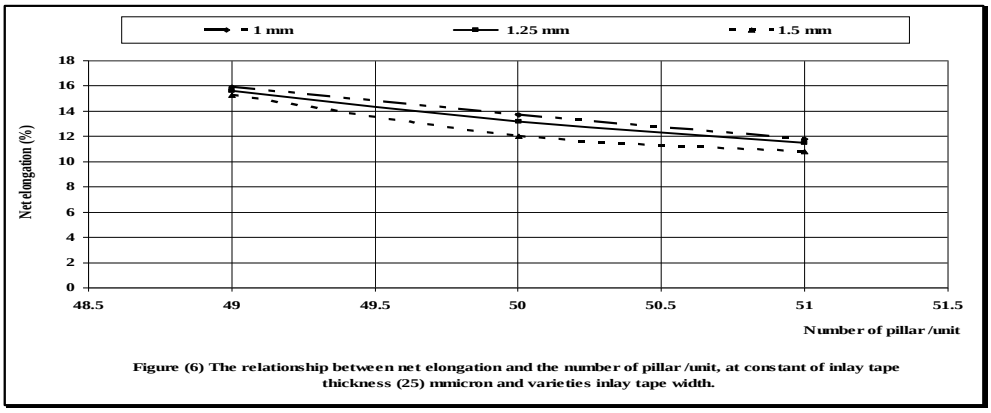

Figure (6) The relationship between net elongation and the number of pillar /unit, at constant of inlay tape thickness (25) mmicron and varieties inlay tape width.

Table (11) regression equation and correlation coefficient for the effect of number of pillar on net elongation, at inlay tape 25 micron and varieties inlay tape width .

Number of pillar	Regression equation	Correlation coefficient
49	Y =16.8X - 0.9	-0.8660254
50	Y = 15.9X – 2.2	-0.72690046
51	Y =13.1X - 1.3	-0.73131071

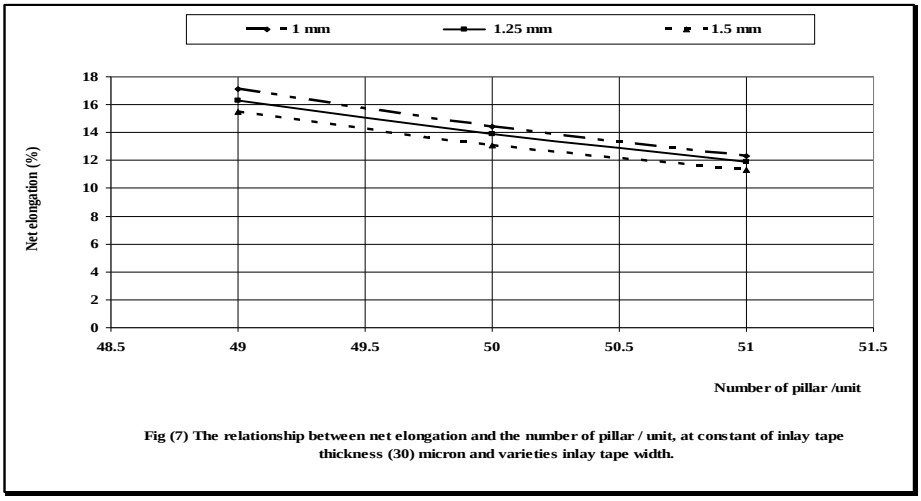

Fig (7) The relationship between net elongation and the number of pillar / unit, at constant of inlay tape thickness (30) micron and varieties inlay tape width.

Table (12) regression equation and correlation coefficient for the effect of number of pillar on net elongation, at inlay tape 30micron and varieties inlay tape width .

Number of pillar	Regression equation	Correlation coefficient
49	Y =19.5X - 2.4	-0.8660254
50	Y = 16.2X – 1.8	-0.7924058
51	Y =13.7 X - 1.4	-0.8029550

Inlay Tensile strength

It is clear from the diagrams from (8) to (10) that there is a direct relationship between Inlay Tape thickness and tensile strength this is due to that the increase in inlay thickness cause the fabric to be more compacted leading to the increase in tensile strength.

It can also be noticed from tables, that there is a direct relationship between inlay tape width and tensile strength, we can report that the increase in inlay tape width leads to higher compactness in the produced fabric, thus increase its tensile strength. So the inlay tape produced with 1.5 mm width has recorded the highest rates of tensile strength, followed by inlay tape produced with 1mm width and then inlay tape produced with 20 Mic. thickness, which achieved the lowest rates, and it was found that the difference between both of them was infixed. We can report that the decrease in stress on inlay tape during manufacture cause the increase in the consistence between yarns in inlay tape which increases the cutoff durability leading to the increase in inlay tape tensile strength

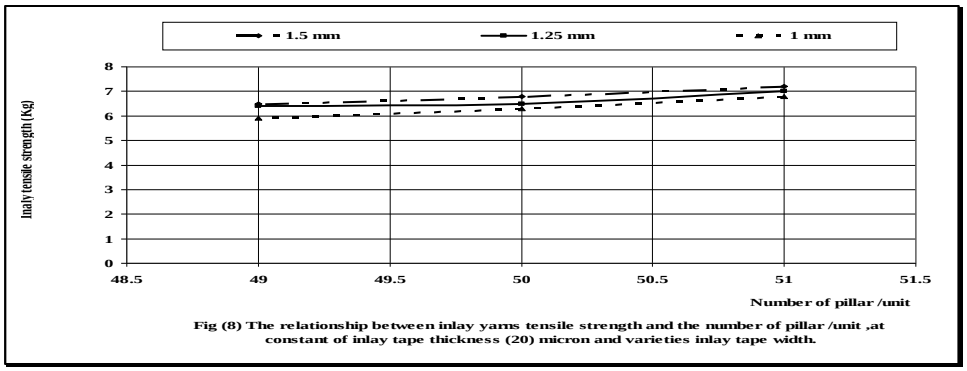

Fig (8) The relationship between inlay yarns tensile strength and the number of pillar /unit ,at constant of inlay tape thickness (20) micron and varieties inlay tape width.

Table (13) regression equation and correlation coefficient for the effect of number of pillar on inlay tape tensile strength, at inlay tape thickness 20 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =4.766667X + 1.2	0.9333254
50	Y = 5.283333X +1	0.99333399
51	Y =6 X +0.8	1

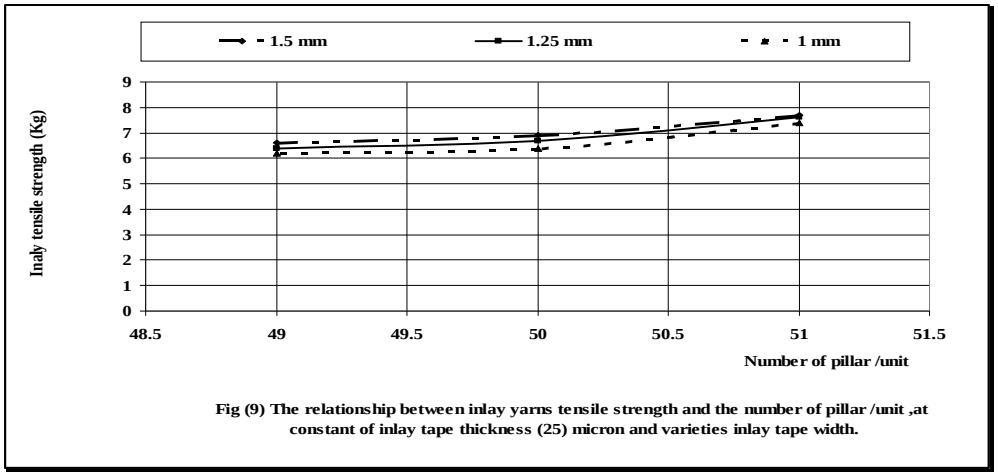

Fig (9) The relationship between inlay yarns tensile strength and the number of pillar /unit ,at constant of inlay tape thickness (25) micron and varieties inlay tape width.

Table (14) regression equation and correlation coefficient for the effect of number of pillar on inlay tape tensile strength, at inlay tape thickness 25 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =4.5X + 0.8	1
50	Y = 5.416667X +1	0.9933399
51	Y =6.816667 X +0.6	0.981981

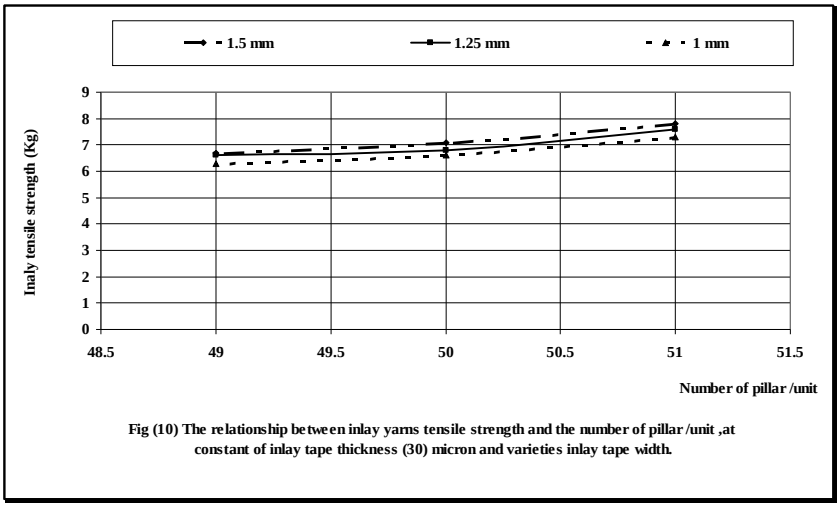

Fig (10) The relationship between inlay yarns tensile strength and the number of pillar /unit ,at constant of inlay tape thickness (30) micron and varieties inlay tape width.

Table (15) regression equation and correlation coefficient for the effect of number of pillar on inlay tape tensile strength, at inlay tape thickness 30 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =5.533333X + 0.8	1
50	Y = 5.5833333X +1	0.9933399
51	Y =6.316667 X +1	0.993399

Inlay Elongation %

It can be seen from tables and figures that the more inlay tape width, the lower elongation the samples become. We can report that the increase in this fabrics compact increase the consistence between the yarns which cause the decrease in elongation.

It is also clear from figures that, there is an inverse relationship between inlay tape thickness and elongation. Increase in inlay tape thickness increases its density, thus the contact areas between fibers will be increased leading to decrease in its elongation break.

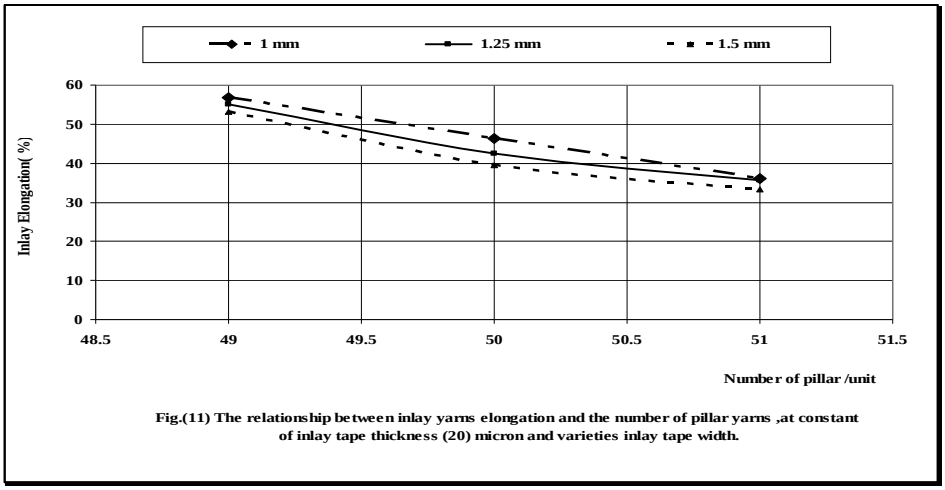

Fig.(11) The relationship between inlay yarns elongation and the number of pillar yarns ,at constant of inlay tape thickness (20) micron and varieties inlay tape width.

Table (16) regression equation and correlation coefficient for the effect of number of pillar on inlay tape elongation, at inlay tape thickness 20 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =64.31667X - 7.4	-0.999878
50	Y = 59.76667X -3.6	-0.997701
51	Y =41.81667 X -5.5	-0.926456

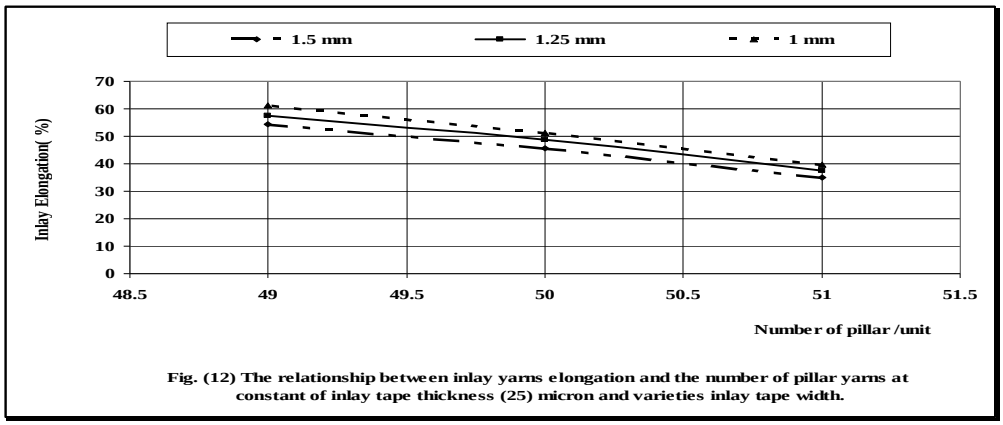

Fig. (12) The relationship between inlay yarns elongation and the number of pillar yarns at constant of inlay tape thickness (25) micron and varieties inlay tape width.

Table (17) regression equation and correlation coefficient for the effect of number of pillar on inlay tape elongation, at inlay tape thickness 25 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =71.4X - 10.3	-0.87439
50	Y = 59.1X -7.9	-0.910182
51	Y =46.8 X -7	-0.8409996

Table (18) regression equation and correlation coefficient for the effect of number of pillar on inlay tape elongation, at inlay tape thickness 30 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =49.46667X - 9.6	-0.998845
50	Y = 62.56667X -11.2	-0.994727
51	Y =74.66667 X -13.6	-0.999656

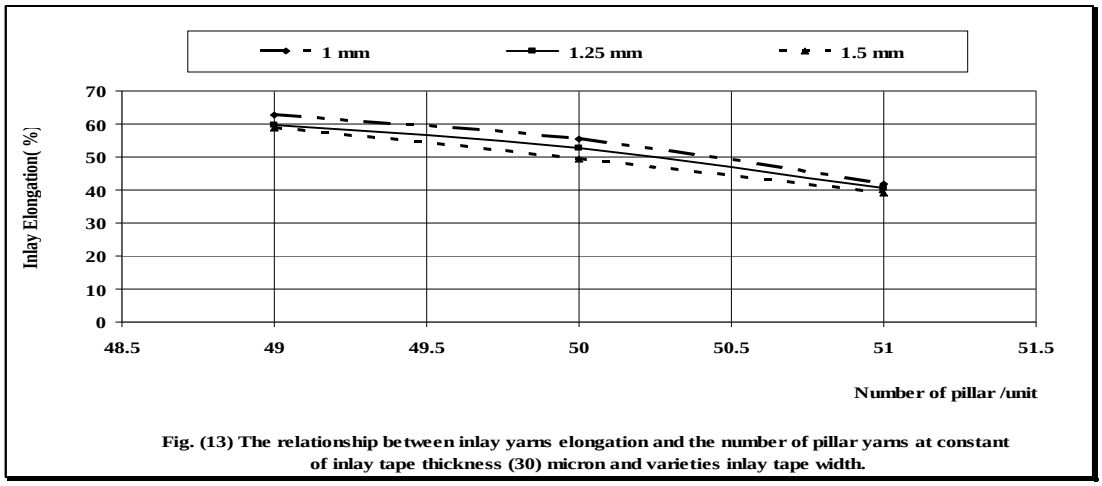

Fig. (13) The relationship between inlay yarns elongation and the number of pillar yarns at constant of inlay tape thickness (30) micron and varieties inlay tape width.

Linear meter weight:

It is clear from the diagrams that samples produced of inlay width tape 1.5 mm have recorded the highest linier meter weight, followed by samples produced of with of 1.25. and then produced of 1 mm .This is due to that tape of 1.5 mm have a lot of weight, causing the produced samples causes an increase in weight ,but the differences are insignificant.

It is obvious from tables that there is a direct relationship between inlay tape thickness and linier meter weight. So samples produced with 30 micron thickness have recorded the highest rates of linier meter weight .We can report that, this is because of the fact that the increase in inlay tape width, means an increase in tapes per unit area which leads to the increase in linier meter weight of inlay tape. But the differences are insignificant.

It was also found that the more pillar yarns per unit area the more linear meter weight the samples become, so samples with 51 pillar yarns per unit area have recorded the highest linier meter weight, whereas samples with 49 pillar yarns per unit area have recorded the lowest linier meter weight. This is due to that an increase in fabric weight means an increase in number of pillar yarns tapes per unit area, which cause increasing in final linier meter weight.

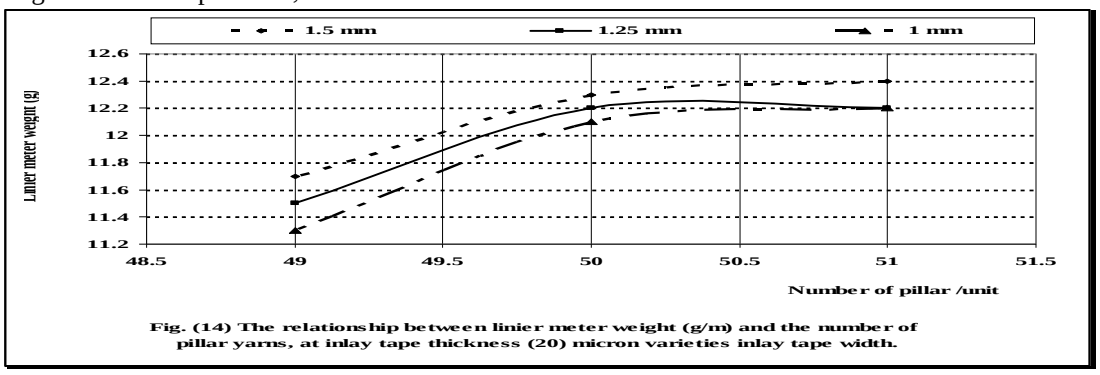

Fig. (14) The relationship between linier meter weight (g/m) and the number of pillar yarns, at inlay tape thickness (20) micron varieties inlay tape width.

Table (19) regression equation and correlation coefficient for the effect of number of pillar on linier meter weight, at inlay tape thickness 20 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =10.5X + 0.8	1
50	Y = 11.7X +0.4	1
51	Y =11.766 X +0.4	1

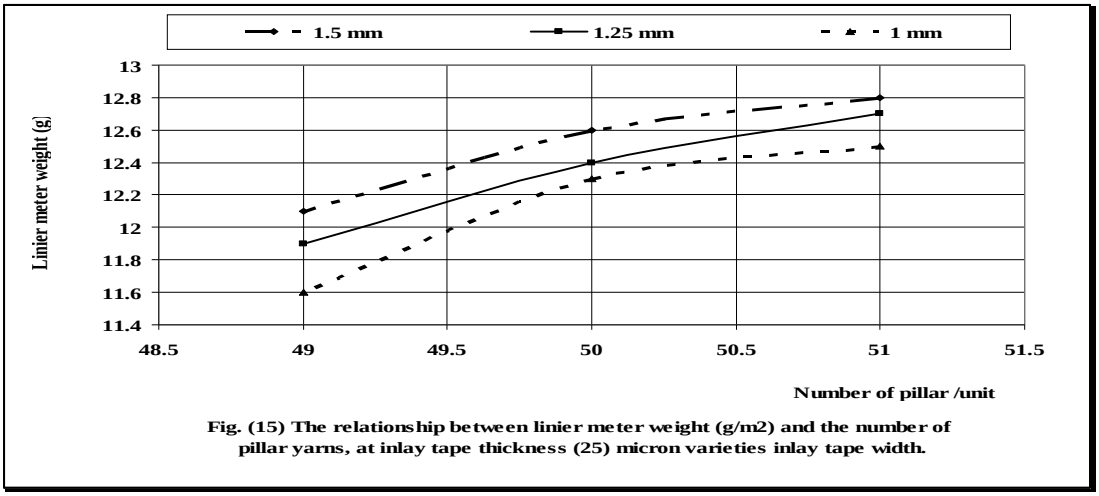

Fig. (15) The relationship between linier meter weight (g/m2) and the number of pillar yarns, at inlay tape thickness (25) micron varieties inlay tape width.

Table (20) regression equation and correlation coefficient for the effect of number of pillar on linier meter weight, at inlay tape thickness 25 micron and varieties inlay tape width .

Number of pillar	Regression equation	Correlation coefficient
49	Y =10.61667X + 1	0.9933999
50	Y = 11.683333X +0.6	0.981981
51	Y =11.91667 X +0.6	0.981981

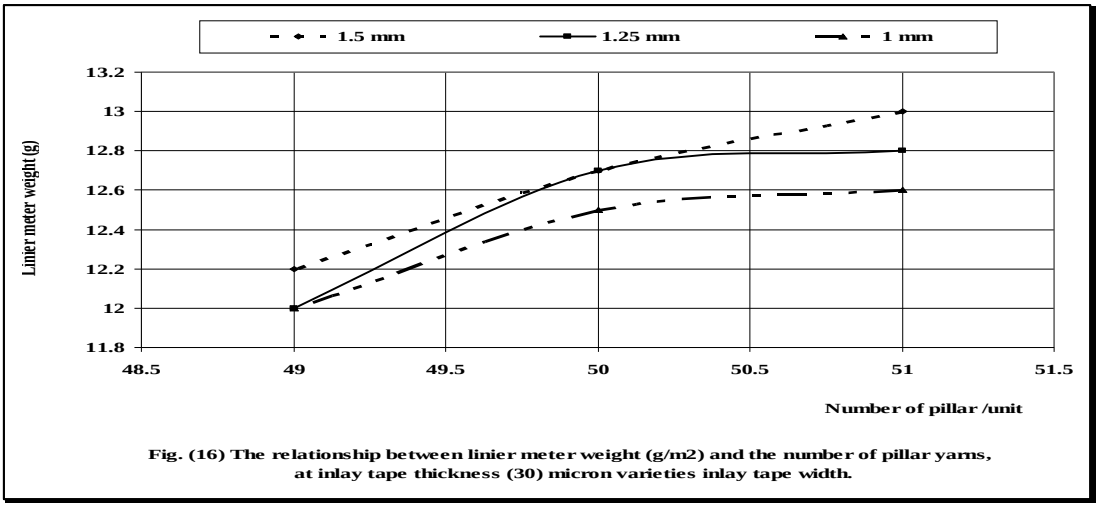

Fig. (16) The relationship between linier meter weight (g/m2) and the number of pillar yarns, at inlay tape thickness (30) micron varieties inlay tape width.

Table (21) regression equation and correlation coefficient for the effect of number of pillar on linier meter weight, at inlay tape thickness 30 micron and varieties inlay tape width

Number of pillar	Regression equation	Correlation coefficient
49	Y =11.56667X + 0.4	0.886025
50	Y = 12.13333X +0.4	0.866025
51	Y =11.8 X +0.8	1

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6/12/2011

Effect of Amino Acid L-leucine On the Musculo-Skeletal Changes during Cast-Immobilization in Adult Male Albino Rats. Physiological and Histological study

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Abstract: The relation between muscle atrophy and bone osteoporotic changes due to immobilization are still not completely understood. This study tried to throw more light on this association and to probe the ability of amino acid L-leucine, to limit these changes in a trial to accelerate rehabilitation. Adult male Albino rats weighing 180-210 g were used and classified into three groups, I-control group, II-cast-immobilized group and III-immobilized-L-leucine treated group. Right hind-limb cast immobilization was performed for 15 days in groups II&III, while L-leucine, was given by oral gavage in a dose 0.7g/kg/day concomitant with immobilization in group III. The initial and final body weights were determined. Blood samples were used for determination of serum levels of total calcium, CPK, ADH, TNFα and Cortisol as well as for plasma MDA and glucose level. In the immobilized right hind-limb after removing the cast, the gastrocnemius muscle was identified, dissected, weighed. Then the right gastrocnemius muscle was prepared for light and transmission electron microscopic studies and the right tibia was prepared for both decalcified and un-decalcified light microscopic studies. Cast-immobilized group II showed significantly increased serum calcium, LDH, CPK, cortisol, TNFα and plasma MDA with non-significant change in blood glucose level. Also immobilization resulted in significantly reduced body weight, reduced gastrocnemius body weight ratio and resulted microscopically in both skeletal muscle atrophy in the gastrocnemius muscle and osteoporosis in the tibia cancellous bone compared with control group. Immobilized -Leucine treated group-III exhibited significantly reduced LDH, CPK, MDA and glucose levels but the levels of calcium was non-significantly altered compared to immobilized non treated group. Although serum cortisol and TNFα levels in leucine treated group were reduced non-significantly compared to immobilized non treated group, microscopically Leucine administration to cast-immobilized rats of group III markedly prevented skeletal muscle atrophy and partially prevented cancellous bone osteoporosis. It is concluded that increased MDA, Cortisol, TNFα with immobilization may explain in part the associated changes in muscle and bone. Leucine prevented these changes which could be attributed to its direct anabolic effect or its ability to reduce oxidative stress and /or its ability to counteract the effect of Cortisol and TNFα rather than reducing their levels. Overall, these data suggesting that leucine intake may represent a nutritional strategy for limiting muscle and bone protein loss as a consequence of immobilization.
[Bataa, M.A.EL-Kafoury, Nagwa Kostandy Kalleny and Ghada Galal Hamam. Effect of Amino Acid L-leucine On the Musculo-Skeletal Changes during Cast-Immobilization in Adult Male Albino Rats. Physiological and Histological study. Life Science Journal,. 2011; 8(2):776-892] (ISSN: 1097-8135). http://www.lifesciencesite.com.

Key words: leucine, immobilization, osteoporosis, muscle atrophy and TNFα
Abbreviations: LDH (lactate dehydrogenase), CPK(Creatine phoshokinase), MDA(malondialdehyde).

1. Introduction

Skeletal muscle is a highly differentiated tissue that has the capacity to adapt to extreme fluctuations in its functional state. Clinical studies had confirmed that skeletal muscle atrophy and strength reduction, secondary to cast-immobilization, cannot always be returned to normal levels despite extensive rehabilitation **(1)**.

As the duration of immobilization has a significant impact on the duration and intensity of rehabilitation **(2)** and the process of musculo-skeletal tissue restructuring seems to require more time than that needed to cause atrophy by immobilization **(3 & 4)** so any intervention that accelerate rate of healing and accelerate rehabilitation is very valuable.

Advances in cell biology have progressed our understanding of those factors that contribute to muscle atrophy. Understanding the molecular mechanisms behind disuse muscle atrophy is important to develop countermeasures in order to prevent muscle wasting and to preserve its function **(5)**. Taking in consideration that immobility per se is a stressful condition and hypercortisolemia was suggested to represent the predominant hormone initiating muscle protein catabolism and bone demineralization **(6 & 7).** Also, Muscle atrophy due to immobilization was attributed to the possible role of inflammatory cytokines **(8)**, or to excess formation of reactive oxygen species (ROS**) (9).**

Muscle is closely related to bone and contains highly osteo-inducible cellular populations that have been implicated to have roles in bone formation and repair. Adjacent muscle acting as a “secondary periosteum” is able to contribute progenitors that can be reprogrammed to form bone **(10)**. Skeletal development and subsequent maintenance of bone mass and morphology during adulthood is greatly influenced by viable muscle function. On the other hand, degraded muscle function, arising by disease or age, is clearly accompanied by diminished bone mass and morphology. Thus, increased muscle function not only has the potential to generate

anabolic mechanical signals for bone, but normal muscle function is required for maintaining a healthy skeleton **(11)**.

In fact, weak muscles compromise the activities of daily living and consequently reduced the quality of life **(12).** Moreover, osteoporosis constitutes a major worldwide public health burden characterized by enhanced skeletal fragility **(13)**.

Protein and amino acids are of the most popular additives given to endurance athletes and body builders to cover the need to synthesize new muscle or to repair muscle damage with heavy training. On many occasions, amino acids are frequently used, since they are easier to absorb than proteins **(14)**. Amino acids is preferable than proteins in some instance where protein may influence the balance between osteoblastic and osteoclastic activity as it increases urinary calcium excretion due to the associated decrease in pH with its excess ingestion **(15)**. Prolonged periods of skeletal muscle inactivity lead to a loss of muscle protein and strength, thus more specific interventions can be designed for the attenuation of protein loss **(5)**.

Leucine is one of the branched-chain amino acids (BCAA); it is an essential amino acid with a role in protein synthesis and may influence maintenance of muscle mass during weight loss **(16)**. Leucine is an anticatabolic agent **(17).** The impact of ingesting extra leucine on muscle protein synthesis and muscle loss in immobilized human muscle has not specifically examined **(18)**.

So the aim of this study was to evaluate both the ability of amino acid leucine to prevent the immobility associated changes in muscle and bone when it is given during immobilization as well as its effects on the changes in MDA, cortisol and TNF-α. The later is to identify its possible mechanism in preventing skeletal muscle atrophy and cancellous bone osteoporosis induced by cast-immobilization.

2. Material and Methods

2.1Experimental animals:

This study was carried out on adult male albino rats weighing 180-210g (n=24). Rats were purchased from Military Animal Farm (Cairo) and maintained in the hold facilities in Physiology Department, Faculty of Medicine, Ain Shams University, under standard conditions of boarding. Water and food were provided *ad libitum.*

2.2 Experimental protocol:

Experimental animals were randomly allocated into three equal groups, 8 rats each:

Group I: Control group.

Group II: Cast-immobilized group.

Group III: Cast-immobilized leucine treated group.

2.3-Experimental procedure:

At the start of the study, the initial body weight was determined then application of the cast was done.

Unilateral cast-immobilization technique:

Following anesthesia induced by Ether inhalation, the right hind–limbs of groups II & III were immobilized by applying several layers (4-5) of moistened plaster of Paris strips (GIBSON, supplied by Egyptian Medical Group CO.) from mid thigh to the toes. The cast was applied according to **Nascimento *et al.*, (19)** with little modification. A pad of cotton was applied over the right hind-limb with knee in extension and the ankle in plantar flexion to produce marked atrophy of gastrocnemius muscle as well as to avoid weight bearing on this limb. The dorsum of the toes was left uncovered to check for edema or circulatory problems. The cast was covered by a wire mesh to prevent the rats from eroding the cast **(20)**. The casting procedure let the muscle innervations remain intact. The rats were left immobilized for 15days and they were monitored on a daily basis for chewed plaster, abrasions and venous occlusion, and problems which may require replacement of the cast.

Amino acid treatment:

The powder of L-Leucine was dissolved in distilled water, shacked well and leucine supplementation ~0.7 g/kg/day over a period of 15 days, starting from the first day of immobilization, was given by oral gavage. This dose is considered to be a moderate dose **(21)**. The control and immobilized -non leucine treated group, both were given distilled water at the same route, volume and frequency as the treated group. (L-Leucine powder, B.D.H, Laboratory chemicals, England, was supplied by Biochemistry Department, Faculty of Medicine, Ain Shams University).

On the day of sacrifice, overnight fasted rats with free access to water were anaesthetized by intra-peritoneal injection of thiopental sodium in a dose of 40mg/kg body weight. After careful removal of the cast in the immobilized groups, the final body weight was determined and then the rats were subjected to the following studies:

I) Biochemical study:

At the end of the experimental period, midline abdominal incision was done and the abdominal aorta was cannulated for collection of blood samples. The first sample collected in dry tube, then centrifugation was done at 3000 rpm for 15 min to separate serum for measuring the levels of total calcium, CPK, LDH, cortisol and TNFα. Another blood sample was taken in heparinized tube and centrifuged at 4000 rpm to separate plasma for determination of glucose and MDA levels. Serum was kept at -80^{o}C until the day of analysis

-Estimation of fasting plasma glucose was done by enzymatic colorimetric methods, using kit provided by Beckman Insturments, Inc., Brea, USA **(22).**

- Measurements of malondialdehyde (MDA) as an indicator of lipid peroxidation were carried out using thiobarbituric acid (TBA) **(23).**

-Serum cortisol was measured according to the manufacture's instructions by the use of Immulite Cortisol kit supplied by Diagnostic products corporation (DPC) depending on competitive immunoassay method.
-TNFα was estimated by ELISA technique according to the manufacture's instructions. TNFα kit was supplied by Biosource International, Inc., California, USA (purchased from Gamma – Trade CO.).
-Creatine phosphokinase activity (CPK) and Lactate dehydrogenase activity (LDH) were determined by colorimetric method at 340nm wave length, using kits supplied by Biodiagnostic- Egypt.
-Total serum calcium was determined using the colorimetric method at wave length 570 nm. Kit was supplied by Teco Diagnostics, Anaheim. **(24)**.

II)- Muscle weight Study:

The right hind-limbs gastrocnemius muscles were excised, gently trimmed of neighboring tissue, wet-weighed. Wet-weights of the muscles were recorded as ratios of total final body weights.

III)-Histological study:

A) Skeletal muscle:

The gastrocnemius muscles of right hind-limbs were longitudinally divided into medial and lateral halves. The medial halves were fixed in 10% formalin and processed for light microscopic study (LM), while the lateral halves were processed for transmission electron microscopic study (TEM). The left hind-limb was not used as a control limb because overloading on it may induce hypertrophy and its muscle may be affected by the changes in blood chemistry due to immobilization. So, separate control animals of the same average weight were used.

For LM study, 10% formalin fixed muscle slices were processed to form paraffin blocks. Serial longitudinal and transverse sections, 5µm thick, from the central part of the medial halves of the gastrocnemius muscle were prepared. Then, the sections were stained with hematoxylin and eosin stain (H&E) **(25)** and Mallory stain **(26)**.

For TEM study, phosphate buffered gluteraldehyde fixed small pieces (1-2mm thick) from the central part of the lateral halves of the muscle were processed to form capsules. Semi-thin longitudinal sections were cut at 1µm in thickness using glass knife, stained by 1% toluidine blue in 1% borax and examined by the light microscope. Ultra-thin sections (50-60 nm in thickness) were cut using ultra-microtome. Then sections were mounted on copper grids and stained with saturated solution of uranyl acetate **(27)** followed by lead citrate **(28)**. Ultra-thin sections were examined and photographed by JEM-1200EXII transmission electron microscope in Faculty of Science, Ain Shams University.

B) Cancellous bone:

The tibias of rats' right hind-limbs were carefully dissected and then immediately fixed in neutral buffered formaldehyde for 2 days. After fixation, halves of the proximal metaphysis of the right tibias were processed for preparation of decalcified specimens, and the other halves were processed for preparation of un-decalcified specimens. Decalcification was performed by using the chelating agent, ethylene-diamine-tetra-acetic acid (EDTA) in the form of its disodium salt (5.5 g ethylenediaminetetraacetic acid in 90 ml distilled water and 10 ml formaldehyde 37–40%). Decalcification was carried out for 4 weeks, during which time the decalcifying solution was changed every day **(29).** The decalcified specimens were dehydrated and processed to form paraffin blocks. Serial longitudinal sections, 5µm thick were prepared. Then, the sections were stained with H&E **(25).**

The un-decalcified specimens were cut longitudinally into small pieces, 3–5mm thick, dehydrated in ascending grades of alcohol, then in one change of acetone for 15 minutes. Acrylic resin embedding medium were freshly prepared and were applied to the specimens with acetone in 1:1 ratio. Then the specimens were embedded in freshly prepared acrylic resin-embedding medium of medium consistency that was formed by mixing 20ml EM bed-812, 16ml dodecenyl succinic anhydride, 8ml nadic methyl anhydride and 0.77ml dimethylamino methyl phenol. The specimens were left in a shaker for 1 day, and then they were transferred into special capsules, one specimen in each capsule. Freshly prepared acrylic resin embedding medium was applied. Capsules were then placed in an oven at 58^{o}C for 2 days. When cooled, the capsules were broken and trimmed to a suitable shape for the microtome. Serial longitudinal semi-thin sections were cut at a thickness of 1–2µm using a glass knife and an ultramicrotome **(30)**. Sections were then stained using modified Von Kossa's technique **(29).**

IV- Histomorphometric and Statistical Study:

All histomorphometric studies of both skeletal muscle and cancellous bone were performed using Image Analyser (Olympus Image J, NIH, 1.41b, USA) in the Oral pathology Department, Faculty of Dentistry, Ain Shams University.

A) Skeletal muscle:

The mean fiber cross-sectional area of 100 muscle fibers, from randomly chosen fields in the central region per muscle section stained by H&E of each gastrocnemius muscle, was performed. The reason for choosing quantification based on cross sectional area of muscle fibers is that this parameter is not affected by edema or relative increase in connective tissue **(31)**.

B) Cancellous bone:

The histomorphometric parameters for bone were defined according to the report by the American Society for Bone and Mineral Research committee **(32)**.

- **Trabecular Bone Volume (%):** percentage of cancellous bone area occupied by trabeculae and expressed as percentage of total measured area (area of trabeculae and bone marrow space) **(33)**.

- **Osteoid thickness (µm):** mean thickness of the osteoid layer overlying the bone trabeculae **(34)**.
- **Relative Osteoid Surface (%):** percentage of cancellous bone surface covered with osteoid **(33)**.

$$\frac{\text{Length of trabecular surface covered by osteoid tissue}}{\text{Total length of trabecular surface}} \%$$

- **Relative Bone Resorption Eroded Surface (%):** percentage of cancellous bone surface with areas of resorption **(33)**.

$$\frac{\text{Length of eroded trabecular surface}}{\text{Total length of trabecular surface}} \%$$

All trabecular bone histomorphometric measurements were performed, beginning at more than 1mm from the growth plate–metaphysial junction to exclude the primary spongiosa and thus restrict measurements to the secondary spongiosa of proximal tibia metaphysis. The secondary spongiosa extending between 1.0 and 1.9 mm from the epiphyseal growth plate, 3.7 mm wide, centered on the long axis of the bone. For each group of rats, slides from studied animals were examined and eight fields were analyzed for a total metaphyseal area of 1.7 mm^2 **(33)**. The mean values of 40 fields, [8 different fields from five serial sections], were estimated.

Statistical studies:

The means of all measured parameters (biochemical, weight, histomorphometric) were performed and the standard error of mean (SEM) was calculated and statistical analysis was done using SPSS statistical program version 17. Data were evaluated by using one way analysis of variance test (ANOVA). As regards the probability, the least significant level used was at $p < 0.05$.

3. Results

I- Biochemical Results

As shown in table (1) & figure (1), immobilization in group II was associated with significantly increased ($p<0.05$) plasma level of malondialdehyde (MDA) compared to control rats, while leucine treatment concomitants with immobilization in group III significantly ($p<0.05$) reduced plasma MDA level compared to immobilized group. However the plasma MDA level with leucine still significantly ($p<0.05$) higher compared to control rats (Fig. 1A).

While serum levels of total calcium was significantly ($p<0.05$) increased in immobilized group II compared to control rats, it was non-significantly differ between leucine treated group and both of control rats and immobilized group II (Fig. 1B).

Immobilization in group II, also caused significant ($p<0.05$) increase in both serum creatine phosphokinase (CPK) and lactate dehydrogenase (LDH) levels compared to control group. On the other hand leucine treatment with immobilization was associated with significant reduction in both of CPK and LDH compared to immobilized group, but their levels were still significantly higher compared to control (Figs. 1C & 1D).

Although plasma level of glucose with immobilization in group II was non-significantly differ compared to control, it was significantly ($p<0.05$) reduced in leucine treated group compared to immobilized group. However its value was non-significantly differing from that of control (Fig. 1E).

Immobilization in group II was associated with significantly increased serum cortisol and serum TNFα. ($p<0.05$ for both) compared to control rats. On the other hand, in leucine treated group, the serum levels of both cortisol and TNFα were reduced though non-significantly compared to immobilized group. However, cortisol level still higher significantly ($p<0.05$) compared to control and TNFα still higher non-significantly compared to control (Figs. 1F & 1G).

II- Body Weight and Gastrocnemius Muscle Weight Results

As shown in table (2), immobilized group rats exhibited significant ($p<0.05$) reduction in final body weight and significant reduction in absolute weight of gastrocnemius muscle as well as its weight to body weight ratio ($p<0.05$ for both). Meanwhile, in leucine treated group the final body weight was non-significantly differ from control, but it was significantly ($p<0.05$) higher compared to immobilized non treated group II.

Leucine treatment associated with significant ($p<0.001$) increase in absolute weight of gastrocnemius muscle as well as its ratio to body weight compared to immobilized non treated rats.

III- Histological Results

A) Skeletal muscle:

1. Group I (Control group):

As shown in figure (2), the gastrocnemius skeletal muscle of control group in transverse sections stained with Mallory showed collagenous connective tissue surrounding the bundles of muscle fibers within the gastrocnemius muscle, the perimysium. Each muscle fiber itself was surrounded by a delicate layer of connective tissue, the endomysium (Fig. 2A). In H&E stained transverse sections, the gastrocnemius muscle appeared consisted of muscle fibers collected in bundles. The myofiber oval nuclei were usually found at the periphery of the cell under the cell membrane (Fig. 2B). The sarcoplasm was filled with long cylindrical bundles of multinucleated myofibrils, which run parallel to the long axis of the muscle fiber. The entire muscle fiber exhibited a characteristic pattern of cross-striations of alternating light (I-bands) and dark bands (A-bands) as shown in longitudinal H&E and semi-thin sections stained by toluidine blue (Figs. 2C & 2D). In-addition TEM revealed that the I-band appeared bisected by a dark transverse line, the Z-line. The repetitive subunit of the contractile apparatus, the sarcomere, extended from

Z-line to Z-line. The A-band showed the presence of a lighter zone in its center, the H-band, bisected by the M-line. Oval myonucleus with finely dispersed chromatin throughout the nucleoplasm, with only a small amount of margination was observed and the nuclear membrane showed small indentations in its contour. Glycogen was obvious in the sarcoplasm in the form of coarse granules and mitochondria were also normally observed (Figs. 2E & 2F).

2. Group II: cast-immobilized group

As shown in figure (3), cast-immobilized gastrocnemius muscle showed apparent increased content in the collagenous connective tissue in both the endomysium and the perimysium compared with control in Mallory stained transverse sections (Fig. 3A). Moreover, transverse sections stained with H&E showed apparent widening of the interstitial spaces between muscle fibers with apparent decrease in most fiber cross-section area compared with control. Some myofibers showed central core-like lesions and some fibers exhibited central nuclei (Fig. 3B). Hypercontraction areas in some muscle fibers were obvious in longitudinally H&E stained sections (Fig. 3C). Moreover, undulating sarcolemma and small vacuoles in the myofibers were noticed in semi-thin sections stained by toluidine blue (Fig. 3D). In-addition, many electron-lucent vacuoles were noticed in TEM examination (Figs. 3E, 3F & 3G). The myofibrils showed severely disturbed contractile structure with loss of sarcomere organization and indistinguishable A-band, I-band, and irregular and distorted Z-line with disruption of myofilaments (Fig. 3E). Irregularly shaped markedly shrunken myonuclei with clumped and marginated chromatin with nearby electron-lucent vacoules were also noticed (Fig. 3F). Moreover, the amount of glycogen granules appeared less compared with the control with unapparent normal mitochondria (Fig. 3G).

3. Group III: cast-immobilized leucine treated group

As shown in figure (4), cast-immobilized leucine treated gastrocnemius muscle showed nearly normal content of collagenous connective tissue in the perimysium and the endomysium when compared with control in Mallory stained transverse sections (Fig. 4A). Transverse sections stained with H&E showed muscle fibers collected in bundles with oval nuclei that were usually found at the periphery of the cell under the sarcolemma (Fig. 4B). Moreover, longitudinal semi-thin sections stained by toluidine blue showed the peripherally placed oval nuclei and revealed the characteristic pattern of transverse striations (Fig. 4C). In addition, TEM showed preservation of the contractile banding structure of muscle fibers in which the myofilaments were oriented parallel to the long fiber axis nearly similar to control. The oval myonuclei showed evenly dispersed peripheral chromatin lying under the nuclear membrane (Fig. 4D). Plenty of glycogen granules in the sarcoplasm with nearby intact mitochondria were observed compared with group II (Fig. 4E).

B) Cancellous bone:

1- Group I (control group):

As shown in figure (5), H&E stained longitudinal decalcified sections of the proximal tibia metaphysis of control rats revealed that its cancellous bone secondary spongiosa consisted of a network of branching and anastomosing bone trabeculae separated by bone marrow spaces. The bone marrow was formed of hematopoietic tissue, scattered adipocytes, and blood sinusoids (Fig. 5A). The bone trabeculae consisted of irregular bone lamellae and contained lacunae housing osteocytes in between bone lamellae. The bone trabeculae were covered with endosteum showing flat osteoprogenitor cells and cuboidal osteoblasts (Fig. 5B). The matrix of some trabeculae showed more basophilic stainability (Fig. 5A), and cement lines were observed as basophilic lines (Fig. 5B). In-addition, longitudinal un-decalcified semi-thin sections stained by modified Von Kossa's technique showed a red zone of unmineralized bone matrix (osteoid) overlying the mineralized bone, which appeared black (Fig. 5C).

2- Group II: cast-immobilized group

As shown in figure (6), the cancellous bone of secondary spongiosa of the proximal tibia metaphysis of this group in longitudinally decalcified H&E stained sections appeared as thin trabeculae with small pieces of bone spicules. Widening of bone marrow spaces and apparent increased numbers of adipocytes were noticed compared with the control group (Fig. 6A). Resorption areas on bone surface containing multinucleated osteoclasts showing their characteristic acidophilic cytoplasm were obvious (Fig. 6B). Moreover, longitudinal un-decalcified semi-thin sections stained by modified Von Kossa's technique showed multiple resorption areas and apparently thin red zone of osteoid (unmineralized bone) on the mineralized bone that appeared black compared with control (Fig. 6C).

3- Group III: cast-immobilized leucine treated group

As shown in figure (7), H&E stained decalcified longitudinal sections of the proximal tibia metaphysis secondary spongiosa of this group revealed that the cancellous bone trabeculae appeared thicker compared with group II with less apparent widening of bone marrow spaces, which also contained apparently less adipocytes than in group II (Fig. 7A). The bone trabeculae were covered with endosteum which showed flat osteoprogenitor cells and cuboidal osteoblasts on one surface which appeared smooth; whereas the other bone surface appeared irregularly eroded (Fig. 7B). In-addition longitudinal un-decalcified semi-thin sections stained by modified Von Kossa's technique showed resorption areas and a red zone of unmineralized bone

matrix (osteoid) covering the mineralized bone, which appeared black (Fig. 7C).

IV) Histo-morphometric and Statistical Results

A) Skeletal muscle:

As shown in table (3), cast-immobilized gastrocnemius muscle of group II showed significant decrease ($p<0.05$) in the mean fiber cross-sectional area compared with control group. On the other hand, leucine treatment to cast-immobilized rats of group III showed significant increase ($p<0.05$) in the mean fiber cross-sectional area compared with group II and non-significant decrease ($p>0.05$) compared with group I.

B) Cancellous bone:

As shown in table (3), both cast-immobilized tibia of group II and cast-immobilized leucine treated tibia of group III showed significant decrease ($p<0.05$) in the mean trabecular bone volume, mean osteoid thickness and mean percentage of relative osteoid surface compared with control group. On the other hand, leucine treatment to cast-immobilized rats of group III showed significant increase ($p<0.05$) in these previous parameters compared with group II. Moreover, both cast-immobilized non-treated tibia in group II and cast-immobilized leucine treated tibia in group III showed significant increase ($p<0.05$) in the mean relative resorption eroded surface compared with control group. On the other hand, leucine treatment to cast-immobilized rats of group III showed significant decrease ($p<0.05$) in the mean percentage of relative resorption eroded surface compared with group II.

Table (1): Showing the biochemical measured parameters in the different studied groups.

	Control	Immobilized	Immobilized + L-leucine
MDA(Umol/L)	3.21 ± 0.03 (8)	4.32 ± 0.03[a] (8)	3.51± 0.04[ab] (8)
Plasma Calcium (mg/dl)	10.3 ± 0.38 (8)	11.54 ± 0.41 [a] (8)	10.97 ± 0.38 (8)
CPK(U/L)	240.9 ± 4.8 (8)	307.1 ± 6.3 [a] (8)	279.3 ± 3.7[ab] (8)
LDH(U/L)	295.0 ± 3.7 (8)	417.8 ± 5.7[a] (8)	327.6 ± 6.6[ab] (8)
Glucose (mg/dl)	98 ± 2.1 (8)	102.5 ± 0,45 (8)	95.6 ± 1.2[b] (8)
Cortisol (ug/dl)	2.0 ± 0.09 (6)	2.35 ± 0.1 [a] (6)	2.2 ± 0.04[a] (6)
TNF-α(pg/ml)	11.5 ± 0.36 (8)	12.9 ± 0.44 [a] (8)	12.0 ± 0.45 (8)

- Values are mean ± SEM. - Number in parenthesis indicates the number of rats.
- **a:** significance of difference by LSD from control group at least $p<0.05$.
- **b:** significance of differences by LSD from immobilized group at least $p<0.05$.

Table (2): The changes in body weight, absolute and relative weight of gastrocnemius muscle in the different studied groups

	Control	Immobilized	Immobilized + L-leucine
Final Body weight(gm)	229.7 ± 3.2 (8)	201.9 ± 3.0 [a] (8)	222.0 ± 1.59 [b] (8)
Weight of Gastrocnemius muscle (mg).	514.4 ± 5.84 (8)	415.0 ± 4.12[a] (8)	495.4 ± 1.04 [ab] (8)
Gastrocnemius/ body weight ratio.(mg/gm)	2.24 ± 0.01 (8)	2.06 ± 0.04[a] (8)	2.22 ± 0.01[b] (8)

- Values are mean ± SEM. - Number in parenthesis indicates the number of rats
- **a:** significance of difference by LSD from control group at least $p<0.05$.
- **b:** significance of differences by LSD from immobilized group at least $p<0.05$.

Table (3): Showing all different histomorphometric muscle & bone parameters in all different studied groups

	Control	Immobilized	Immobilized + L-leucine
Cross-sectional area of muscle fiber (μm2)	3596.38 ± 57.67 (8)	2212.13 ± 178.93[a] (8)	3419.38 ± 72.45[b] (8)
Trabecular bone volume (%)	52.9 ± 2.19 (8)	20.7 ± 0.51[a]	40.9 ± 1.64[ab]

		(8)	(8)
Osteoid thickness (µm)	6.1 ± 0.20 (8)	2.6 ± 0.06**a** (8)	4.3 ± 0.08**ab** (8)
Relative osteoid surface (%)	59.7 ± 0.72 (8)	25.6 ± 0.69**a** (8)	40.3 ± 0.79**ab** (8)
Relative bone resorption surface (%)	8.6 ± 0.31 (8)	19.8 ± 0.90**a** (8)	12.4 ± 0.61**ab** (8)

- Values are mean ± SEM. - Number in parenthesis indicates the number of rats.
- **a:** significance of difference by LSD from control group at least $p<0.05$.
- **b:** significance of differences by LSD from immobilized group at least $p<0.05$.

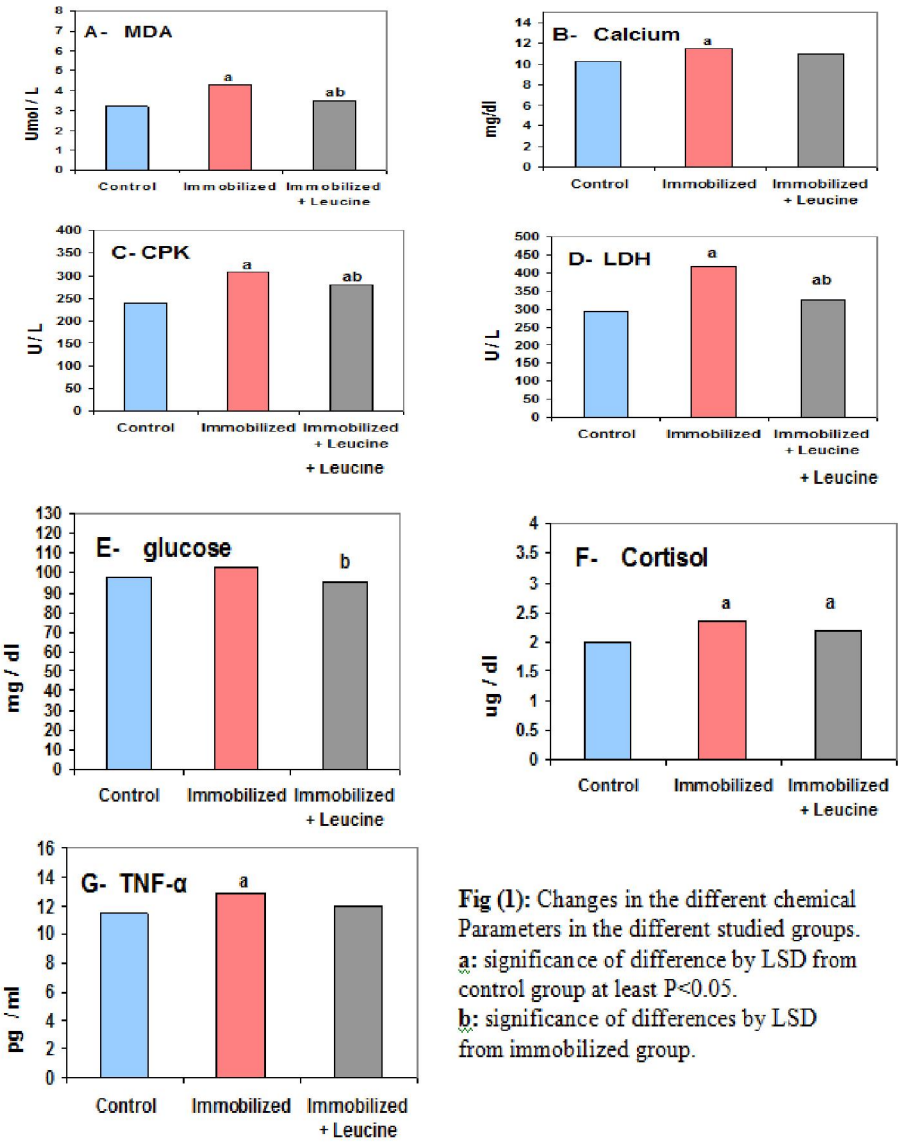
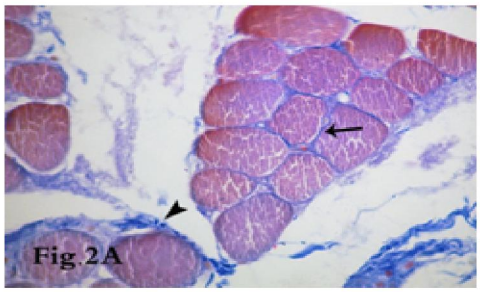
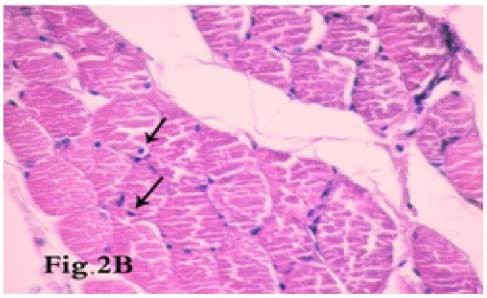
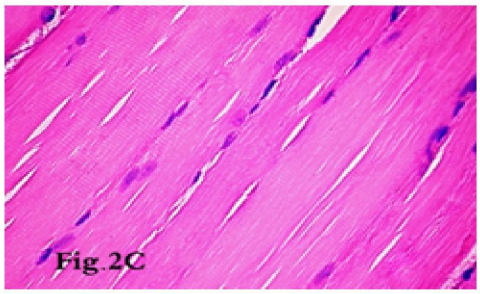
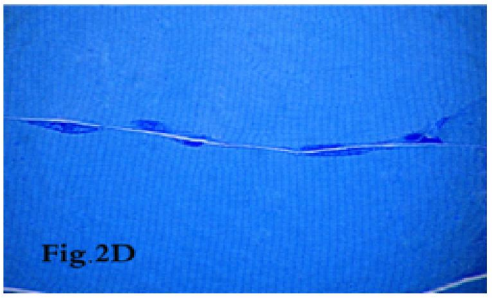


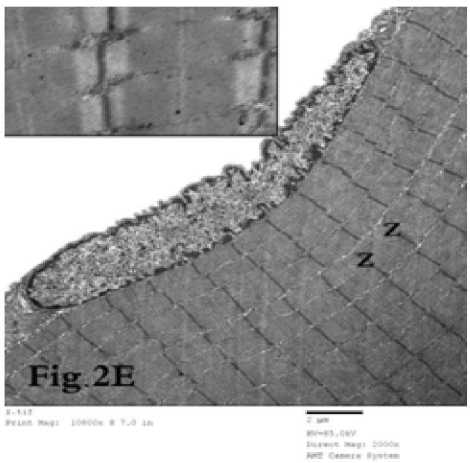
Fig (1): Changes in the different chemical Parameters in the different studied groups.
a: significance of difference by LSD from control group at least $P<0.05$.
b: significance of differences by LSD from immobilized group.











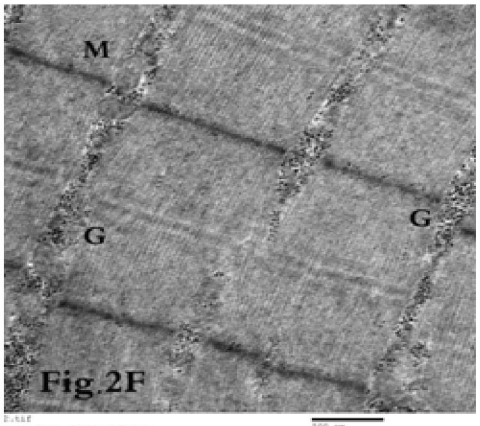


Fig. (2A): A photomicrograph of a transverse section of rat gastrocnemius muscle showing perimysial (▲) collagenous connective tissue surrounding bundle of myofibers and a delicate endomysium (↑) is surrounding each muscle fiber. Group I (Mallory x 640)

Fig. (2B): A photomicrograph of a transverse section of rat gastrocnemius muscle showing bundles of muscle fibers with peripheral oval nuclei (↑). Group I (H&E x 640)

Fig. (2C): A photomicrograph of a longitudinal section of rat gastrocnemius muscle showing long cylindrical bundle of myofibrils running parallel to the long axis of the muscle fiber, exhibiting a characteristic pattern of transverse striations. Group I (H&E x 640)

Fig. (2D): A photomicrograph of a longitudinal semi-section of rat gastrocnemius muscle showing long cylindrical multinucleated cells that show cross-striations of alternating light I-bands and dark bands A-bands. Group I (Toluidine blue x 1000)

Fig. (2E): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing oval myonucleus with finely dispersed chromatin throughout the nucleoplasm, with only a small amount of margination. Regular sarcomeres extending from Z-line (Z) to Z-line are obvious. Notice the Inset, it shows that the dark Z-line is bisecting the I-bands. Group I (TEM x 10800 / inset x 40500)

Fig. (2F): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing A bands with a lighter zone in their centers, the H bands, bisected by the M lines. Notice the glycogen granules (G) and the mitochondria (M). Group I (TEM x 54000)

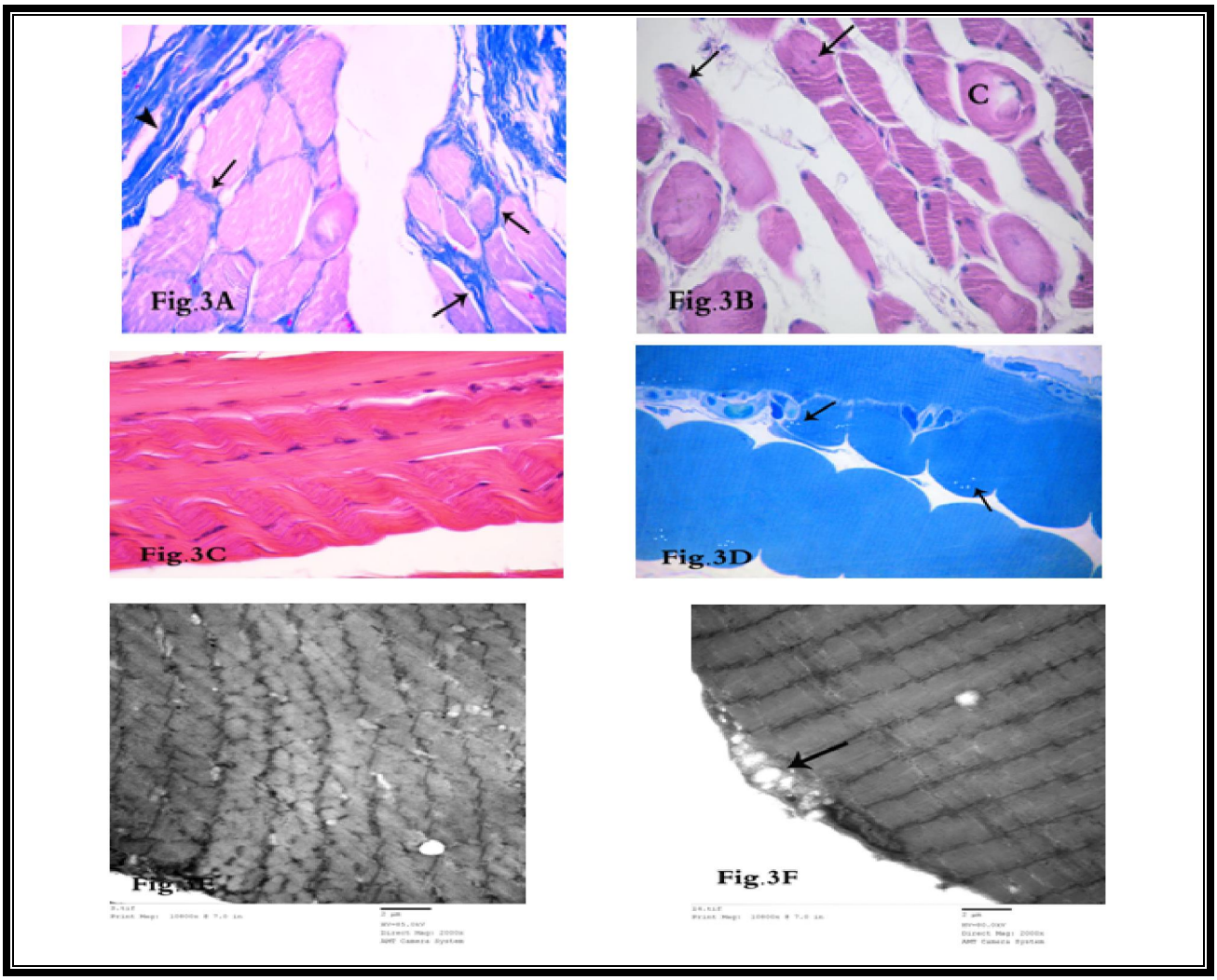


Fig. (3A): A photomicrograph of a transverse section of rat gastrocnemius muscle showing apparent increase content in the collagenous connective tissue in both the endomysium (↑) and the perimysium (▲) compared with control. Group II (Mallory x 640)

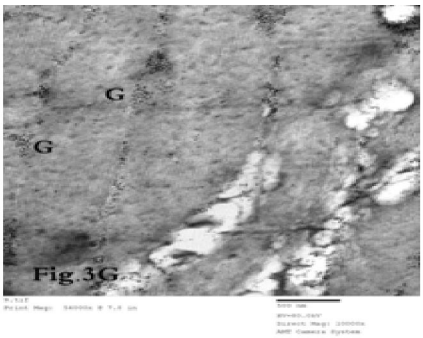
Fig. (3B): A photomicrograph of a transverse section of rat gastrocnemius muscle showing apparent widening of the interstitial spaces between muscle fibers. Most myofibers show apparent decrease in their cross-section area compared with control. Some fibers show central core-like lesions (C). Notice the central nuclei in some muscle fibers (↑). Group II (H&E x 640)

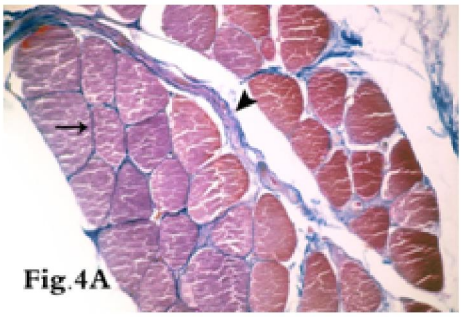
Fig. (3C): A photomicrograph of a longitudinal section of rat gastrocnemius muscle showing hypercontraction areas in some muscle fibers. Group II (H&E x 640)

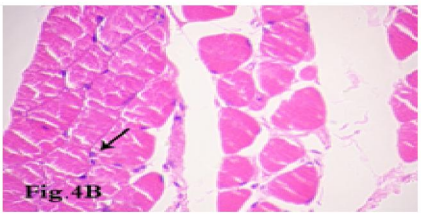
Fig. (3D): A photomicrograph of a longitudinal semi-section of rat gastrocnemius muscle showing undulating sarcolemma. Notice small vacuoles in the myofibers (↑). Group II (Toluidine blue x 1000)

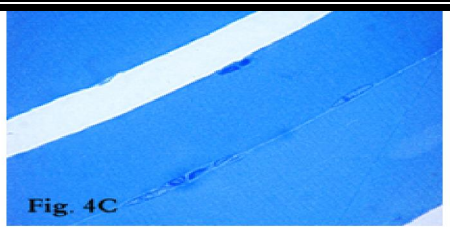
Fig. (3E): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing severely disturbed contractile structure with loss of sarcomere organization and indistinguishable A-band, I-band, and irregular and distorted Z-line with disruption of myofilaments. Notice electron-lucent vacuoles. Group II (TEM x 10800)

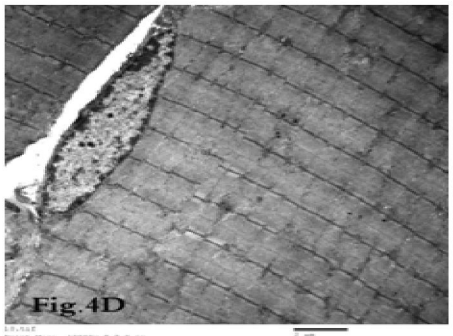
Fig. (3F): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing irregularly shaped markedly shrunken myonuclei with clumped and marginated chromatin with nearby electron-lucent vacuoles (↑). Group II (TEM x 10800)











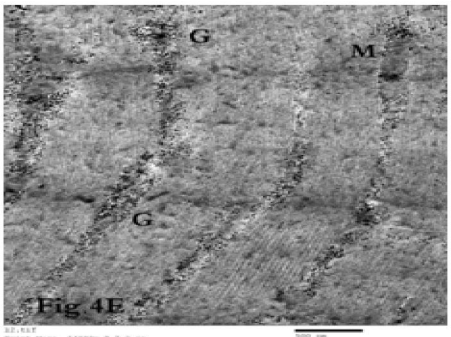


Fig. (3G): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing apparent decrease amount of glycogen granules (G) compared with the control. Notice electron-lucent vacuoles. Group II (TEM x 54000)

Fig (4A): A photomicrograph of a transverse section of rat gastrocnemius muscle showing nearly normal content of collagenous connective tissue in the perimysium (▲) and the endomysium (↑) compared with control. Group III (Mallory x 640)

Fig. (4B): A photomicrograph of a transverse section of rat gastrocnemius muscle showing bundles of muscle fibers with peripheral oval nuclei (↑) nearly similar to control. Group III (H&E x 640)

Fig. (4C): A photomicrograph of a longitudinal semi-section of rat gastrocnemius muscle showing the characteristic pattern of transverse striations. Notice the peripheral oval myonuclei. Group III (Toluidine blue x 1000)

Fig. (4D): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing preservation of the contractile banding structure of muscle fibers. Notice the oval myonucleus with evenly dispersed peripheral chromatin. Group III (TEM x 10800)

Fig. (4E): An electron-micrograph of a longitudinal section of rat gastrocnemius muscle showing plenty of glycogen granules (G) with nearby intact mitochondria (M). Group III (TEM x 54000)

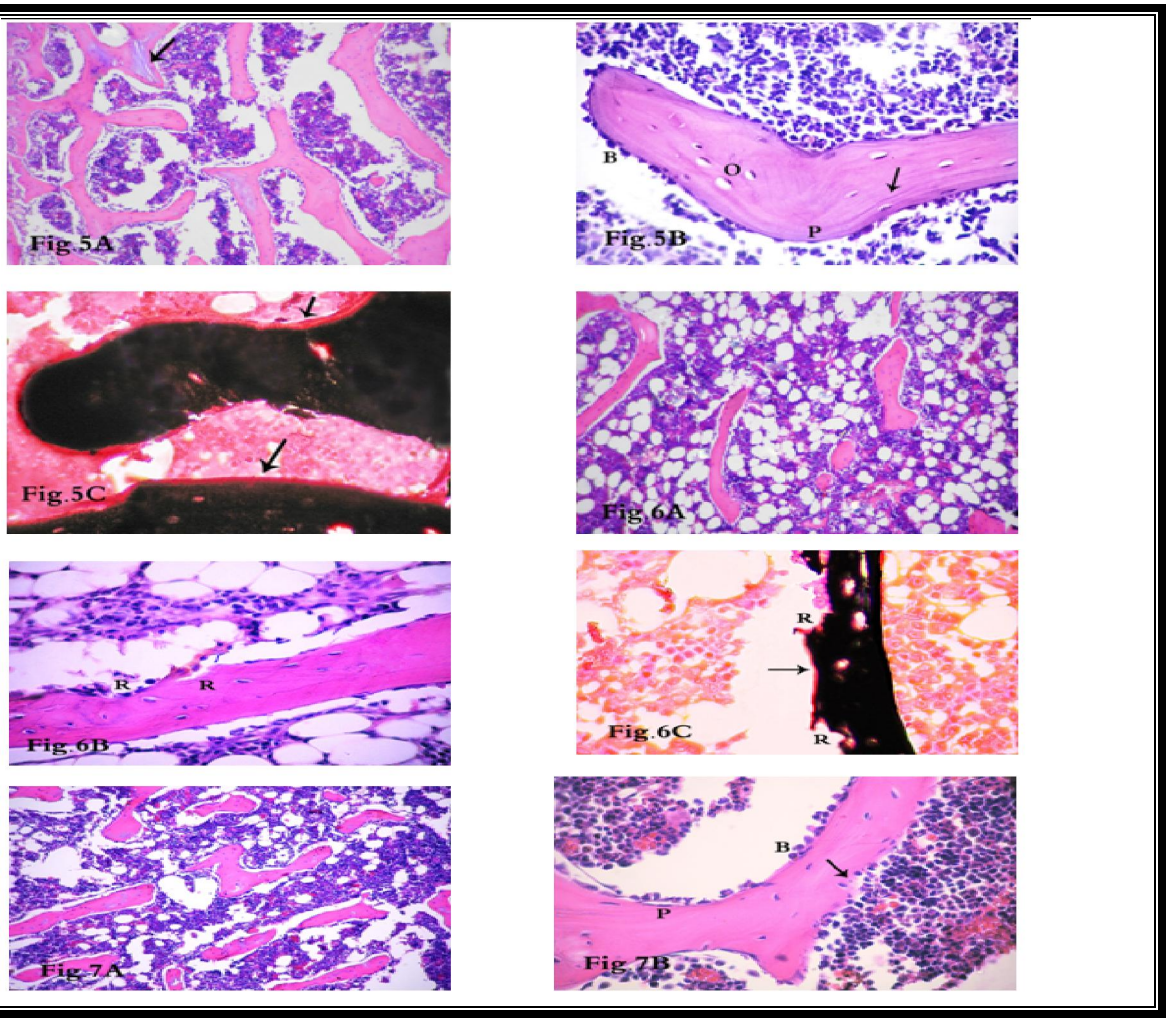


Fig. (5A): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing a network of branching and anastomosing bone trabeculae separated by bone marrow spaces formed of hematopoietic tissue, scattered adipocytes, and blood sinusoids. The matrix of some trabeculae showed more basophilic stainability (↑). Group I (H&E x 250)

Fig. (5B): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing bone trabeculae covered with endosteum showing flat osteoprogenitor cells (P) and cuboidal osteoblasts (B). Osteocytes (O) are seen present inside their lacunae in-between bone lamellae. Notice basophilic cement lines (↑). Group I (H&E x 640)

Fig. (5C): A photomicrograph of an un-decalcified longitudinal semi-section of rat proximal tibia metaphysis secondary spongiosa showing red zone of unmineralized bone matrix (osteoid) (↑) overlying the mineralized bone, which appears black. Group I (Modified Von Kossa x 640)

Fig. (6A): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing thin bone trabeculae with small pieces of bone spicules. Widening of bone marrow spaces and apparent increased numbers of adipocytes compared with the control group is obvious. Group II (H&E x 250)

Fig. (6B): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing resorption areas (R) on bone surface. Group II (H&E x 640)

Fig. (6C): A photomicrograph of an un-decalcified longitudinal semi-section of rat proximal tibia metaphysis secondary spongiosa showing thin red zone of osteoid (unmineralized bone) (↑) on the mineralized bone that appears black compared to control. Notice multiple resorption areas (R). Group II (Modified Von Kossa x 640)

Fig. (7A): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing cancellous bone trabeculae apparently thicker compared with group II. Less apparent widening of bone marrow spaces containing less adipocytes than in group II are obvious. Group III (H&E x 250)

Fig. (7B): A photomicrograph of a longitudinal section of rat proximal tibia metaphysis secondary spongiosa showing bone trabeculae covered with endosteum which shows flat osteoprogenitor cells (P) and cuboidal osteoblasts (B) on one surface which appears smooth; whereas the other bone surface appears irregularly eroded (↑). Group III (H&E x 640)

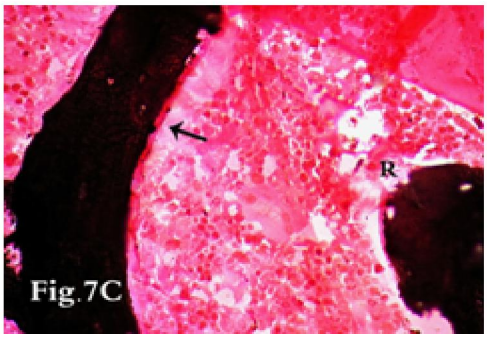


Fig. (7C): A photomicrograph of an un-decalcified longitudinal semi-section of rat proximal tibia metaphysis secondary spongiosa showing red zone of unmineralized bone matrix (osteoid) (↑) covering the mineralized bone, which appears black. Notice the resorption area (R). Group III (Modified Von Kossa x 640)

4. Discussion

The results in this study demonstrated that cast-immobilized group II showed significantly decreased body weight which was noted previously in other studies with immobilization **(35)**. Also immobilized rats in group II exhibited significant decrease in both absolute and gastrocnemius body weight ratio. These findings were observed before with cast-immobilization and explained by the imbalance between protein synthesis and proteolysis and also between apoptosis and regeneration processes **(36).**

On the other hand, leucine treatment significantly increased the weight of gastrocnemius muscle and its ratio to body weight compared to immobilized group which dictate the ability of leucine in ameliorating the atrophic changes due to immobility. Leucine reported to have greater stimulatory effect for muscle protein synthesis **(37)** as it stimulates the activity of protein kinases in muscle with a cascade of anabolic signaling molecules resulting in translation of pre-existing mRNA and translation of specific mRNA coding for regulatory proteins in the muscle **(38 & 39).**

Cast-immobilized right hind-limb rats of group II in this study resulted histologically and histomorphometrically in both skeletal muscle atrophy in the gastrocnemius muscle and osteoporosis in the cancellous bone secondary spongiosa of the proximal tibia metaphysis compared with control group. Similarly, it was previously reported that skeletal muscle atrophy is a morphological adaptation that normally occurs in response to conditions of disuse as immobilization. Both decrease in protein synthesis and increase in protein degradation had been contributed to muscle protein loss due to disuse **(40)**. Moreover, it was previously noticed that skeletal disuse resulted in loss of cancellous bone volume in the proximal tibia **(41)**.

Cast-immobilized gastrocnemius skeletal muscle of group II in this study, revealed widening in the interstitial space. This finding was suggested by **Ferreira *et al.* (42)** to be a result of myofiber edema. They also noticed sarcoplasmic vacuolization in their study on soleus muscle hindlimb-suspended animals and revealed these to be consisted of mitochondrial swelling. Moreover, disrupted mitochondria surrounding irregularly shaped myonuclei was noticed in a previous study on immobilized muscles **(43)**. This coincided with the observation of irregularly shaped markedly shrunken myonuclei with clumped and marginated chromatin by TEM with nearby electron lucent spaces in the cast-immobilized gastrocnemius muscle in group II in this study. Moreover, LM transverse sections of cast-immobilized gastrocnemius muscle of group II in this study showed centrally located nuclei in some myofibers. This was in line with the previously noticed in the skeletal muscle fibers of two weeks hind-limb unloaded rats that resulted in fiber atrophy **(44)**.

Cast-immobilized gastrocnemius muscle fibers in group II in this study presented undulating sarcolemma, hypercontraction areas, central core-like lesions in the myofibers and small vacoules by LM. Moreover, TEM revealed many electron-lucent vacuoles, myofilament loss in-addition to the loss of sarcomere organization and indistinguishable A-band, I-band, and irregular and distorted Z-line; all these led to the severe disturbed contractile structure of the myofibers. These observations in the immobilized muscles might be attributed to be signs of the various stages of the atrophy process, as a result of promoting the disassembly of myofibrillar proteins that anchor myofilaments to the Z-line and maintain sarcomeric alignment **(31)**. Moreover, sarcomere disruption, myofilament loss and the vacuolated myofibers were suggested to be a main component of muscle degeneration in the gastrocnemius muscle of rats immobilized in plaster-of-Paris casts **(45).**

The increased serum creatine phosphokinase (CPK) activity in this study with immobilization is an indicator of muscle damage and so its release. In a previous study it was showed that hind-limb cast-immobilization for 4 weeks reduced the muscle creatine phosphokinase content by about 40% **(46)**.

Also, the increased serum lactate dehydrogenase (LDH) with cast-immobilization in this study may be attributed to the increased proteolysis with immobilization and release of such muscle enzyme.

Immobilization thought to induces insulin resistance and a catabolic state in human skeletal muscle **(47 & 48).** In addition, increased LDH could be possibly due to the effect of immobilization in causing adaptive metabolic transformation of oxidative muscle fiber to glycolysis, and increased lactate formation and hence LDH activity. In line with this explanation immobilization reported to induce prooxidative-to-glycolytic fiber type switching causing increased muscle fatigability **(49).**

On the other hand, the leucine treated group showed a significant decrease in serum levels of LDH and CPK compared to non treated group which may be attributed to its ability to decrease proteolysis. Leucine reported to decrease the increased plasma LDH due to proteolysis with resistance-exercise training **(50).**

Moreover, microscopic examination in this study showed that the gastrocnemius muscle of leucine supplemented cast-immobilized rats (group III) did not reveal atrophic changes that were well pronounced in rats of group II. These observations might be explained according to the reported ability of leucine to interact with the insulin signaling pathway resulting in maintenance of muscle protein by stimulating protein synthesis and reversing the catabolic conditions **(51)**.

Coinciding, group III gastrocnemius muscle revealed that leucine administration preserved the banding structure showing the characteristic pattern of transverse striations and preserved the contractile structure of muscle fibers as the myofibrils were oriented parallel to the long fiber axis nearly similar to control. Thus leucine in this study markedly prevented skeletal muscle atrophic changes. This was in line with what was noted by **Baracos and Mackenzie (52)** that myofibrillar proteins are composed of approximately 18% Branched chain amino acid (BCAA) including leucine. They added that leucine alone could improve protein balance and lean body mass because of its role in regulation of protein synthesis and degradation. Moreover, the unique treatment by BCAA and specifically leucine was hypothesized to provide an important signal of dietary quality for skeletal muscle since dietary BCAAs reach the blood and skeletal muscle virtually unaltered and in direct proportion to dietary intakes **(51)**. In-addition, leucine was reported to stimulate skeletal muscle growth, repair, and regeneration by stimulating activation of myogenic satellite cells in skeletal muscle through mammalian target of rapamycin (mTOR) pathway **(53)**.

Moreover, in this study the plasma MDA level was increased significantly in cast-immobilized group compared to control rats and it could be suggested to play a role in the atrophic changes which were observed in this study. In line with this result suspended muscles as a method for immobilization for 14 days showed to have greater (29% more) content of malondialdehyde (MDA) compared to control rats **(54)**. Mitochondria have been shown to be an important source of ROS production in skeletal muscle during inactivity **(55 & 56).** Several lines of evidence suggested that disuse-induced oxidative stress in skeletal muscle contributes to muscle atrophy by activation of one or more proteolytic pathways **(9).** In addition, the increased MDA level may explain the osteoporotic changes in bone, as oxidative stress reported to induce cancellous bone loss with musculoskeletal disuse **(57).**

On the other hand, leucine supplemented cast–immobilized rats showed significantly lower MDA compared to non treated immobilized group. In line with this result, the role for amino acids supplements in controlling the antioxidant defense system and reducing the oxidative stress was concluded in diabetic skeletal muscle **(58).**

Although, amino acids supplemented group still also exhibiting a high level of cortisol compared to control group and non-significant lower level compared to immobilized, but it showed less catabolic changes. Thus it could be suggested that the direct effect of amino acids in stimulating protein synthesis was able to overcome or to prevent the suspected catabolic effect of cortisol. It is of interest to mention that amino acids is one of positive regulator, while corticosteroids is one of the negative regulator of mammalian target of rapamycin (m-TOR) signaling for protein synthesis in skeletal muscle **(39 & 59).** In addition, the dose of leucine, 0.7g/kg, which used in this study, is considered to be relatively enough as Leucine was reported in a dose 0.1g/kg able to stimulate protein synthesis when it was orally administrated as a single bolus **(21).**

Moreover, as leucine has the same transporter of phenylalanine and tryptophane, amino acids essential for synthesis of catecholamine, and as they compete for uptake via the same transporter **(14)**, it could be suggested that leucine ameliorated the catabolic changes due to stress and catecholamine.

The suggested effect of leucine in counteracting the catabolic changes despite of cortisol level is in line with a previous finding, where the deleterious effects of bed rest on human skeletal muscle which were exacerbated by hypercortisolemia were ameliorated by dietary supplementation of amino acids **(60).** In contradiction with suggestion, dietary branched chain amino acids reported before not to prevent skeletal muscle atrophy in aged rats injected with glucocorticoid **(61)** but the variability in model age as well as the increase of cortisol in this study model is completely intrinsic response without injection may explain this discrepancy.

Casting was mentioned previously to induce disuse loss of muscle mass and atrophy indicated by inducing loss of muscle fiber cross-sectional area **(62).** This coincided with the significant decrease in the mean muscle fiber cross-sectional area in cast-immobilized gastrocnemius muscle in group II in this study compared with control resulting in disuse muscle atrophy. Similarly, **Tipton (18)** stated that muscle may be lost during immobilization through increased negative muscle protein balance mediated by decreased basal levels of muscle protein synthesis, as well as less positive net muscle protein balance due to the decreased

response of muscle protein synthesis to nutritional anabolic stimuli. They added that nutritional interventions should aim at ameliorating muscle loss during injury-induced immobilization. Moreover, extra-leucine was reported to overcome the attenuated response of muscle protein synthesis to nutritional anabolic stimuli in the elderly as they suffer decline in skeletal muscle mass **(63)**.

Coinciding, this study showed that muscle mass loss and atrophy was prevented by leucine administration to rats of group III in which their mean muscle fiber cross-sectional area showed non-significant change compared with control as well as it showed significant increase compared with group II. Similarly, **Baptista *et al.* (64)** noticed that leucine supplementation attenuated muscle mass loss in rats driven by immobilization. In accordance, **Rieu *et al.* (65)** stated that dietary leucine supplementation may represent a useful nutritional tool for maintenance of muscle mass and prevention of muscle atrophy and it may be considered as a good alternative to high protein diets, which could have deleterious effects on renal functions particularly in the elderly.

Cast-immobilized gastrocnemius muscle of group II in this study showed decreased content of glycogen granules compared with control as observed in TEM study. This finding was previously noticed with immobilization **(66).** On the other hand, leucine administration in group III showed apparent increase in glycogen granules and intact nearby mitochondria compared with those of group II. These changes might be explained on basis of the reported ability of leucine to modulate the insulin signal and glucose use by skeletal muscle **(51).**

Although blood glucose level was increased non-significantly with immobilization in group II which may be correlated to effect of associated stress and /or higher cortisol, leucine supplementation in group III showed a significant decrease in plasma glucose level compared to immobilized group to be non-significantly differ from its level in control group. The reduced glucose level with leucine may be attributed to the effect of leucine in stimulating insulin secretion and inhibiting glucagon secretion especially in high glucose state **(67).**

This decrease in blood glucose with leucine supplementation in group III may explain the apparent increased glycogen in gastrocnemius muscle compared with the observed decreased glycogen content with cast-immobilization in group II. Moreover, the reduced glucose level with leucine treatment in group III in spite of the level of cortisol in this group is non-significantly reduced, dictate the impact of leucine interaction with other hormones.

Mallory stained sections of group II cast-immobilized gastrocnemius muscles in this study showed increased content of collagen fibers in both endomysial and perimysial connective tissues compared with group I. These findings are in line with **Järvinen *et al.* (68)** who noticed that the amount of collagenous connective tissue was dramatically increased in the endomysium and perimysium of an immobilized gastrocnemius muscle, with complete disorganization in the perimysial connective tissue. They concluded that intramuscular fibrosis contributed to the deteriorated function and biomechanical properties of the immobilized atrophied skeletal muscle.

On the other hand, leucine administration to rats of group III did not reveal increase in collagen content compared with either control or group II. These results could be explained according to the notes reported by **Babraj *et al.* (69)** in which collagen synthesis rates in skeletal muscle did not respond to increased amino acid levels as leucine because they did not stimulate fibroblast collagen synthesis in skeletal muscle in vivo.

Significant increased serum calcium level was noticed in cast-immobilized group II in this study. Hypercalcemia was attributed to impairment of bone mineralization due to the local effect of casting **(70).**

Moreover, group II in this study showed that cast-immobilization induced osteoporosis proved by the significant decrease in the mean trabecular bone volume, in mean osteoid thickness and in mean percentage of relative osteoid surface and significant increase in the mean percentage of the relative bone resorption eroded surface compared with control; resulting in bone loss demonstrated as small pieces of bone spicules of thin cancellous bone trabeculae showing resorption areas. **Jee and Yao (71)** found that casting-immobilization in rats induced osteoporosis resulting in 60% trabecular bone loss associated with a statistically significant increase in bone resorption and a decrease in bone formation and was significant as early as 14 days from immobilization. They added that immobilization-induced tibial metaphysic model is an appropriate model to test anabolic agents in the prevention and treatment of osteoporosis in an adult.

Widening of bone marrow spaces and apparent increased numbers of adipocytes compared with the control group was also noticed in group II in this study. **Elabd *et al.* (13)** noted that osteoblasts and adipocytes share the same precursor cell, and there is an inverse relationship exists between the two lineages. Thus increase in bone resorption is accompanied by increased bone marrow adiposity.

This study showed that leucine administration to cast-immobilized rats of group III partially prevented osteoporosis since their cancellous bone showed significant increase in the mean trabecular bone volume, in mean osteoid thickness and in mean percentage of relative osteoid surface and significant decrease in the mean percentage of the relative bone resorption eroded surface compared with group II; resulting in protection of the cancellous bone trabeculae of secondary spongiosa of the proximal tibia metaphysis. Coinciding, **Eneroth *et al.* (72)** noted that protein supplementation enhanced recovery from hip fracture surgery and decreased fracture-related complications. Moreover, leucine was previously reported to markedly suppress

proteolysis and inhibit whole-body protein degradation *in vivo* **(73)**. In-addition **Babraj *et al.* (69)** noted that bone collagen synthesis which is an important aspect of bone healing, responded to increased amino acid levels. This is in sharp contrast to the effect of leucine on skeletal muscle collagen. They suggested that lack of response in skeletal muscle and the acute stimulation in bone of collagen synthesis might be indicative of the different roles that collagen plays in the tissues of the musculoskeletal system.

The increased serum tumor necrosis factor alpha (TNFα) in immobilized group II may indicate a condition of inflammation and also may be implemented in the process of muscle atrophy as well as the osteoporotic changes. Tumor necrosis factor reported to inhibit myogenesis through redox-dependent and -independent pathways **(74, 75 & 76).** Moreover, immobilization is commonly associated with increased circulating inflammatory cytokines that was suggested to stimulate osteoclastogenesis and to suppress osteoblast recruitment **(8, 77 & 78).** TNF-α is expressed by T-lymphocytes but both the stromal cell and osteoclast express its receptor. TNF-α promote osteoclast formation and also it has potent antiapoptotic effects on osteoclasts, prolonging their lifespan **(79 & 80).**

In leucine treated group, although the value of serum level of TNFα decreased though non-significantly compared to immobilized non treated group II, and it was still non-significantly higher compared to control group, the skeletal muscle atrophic changes were markedly prevented and the osteoporotic bone changes were partially prevented as demonstrated histologically and histomorphometrically. This is in contradiction with **Lang *et al.* (76)** who mentioned that a cooperative interaction between both TNF-alpha and glucocorticoids during sepsis and inflammation induces leucine resistance and failure of leucine to perform its effect efficiently. Thus from the results in this study, it appeared that there is no resistance which might be attributed to absence of sepsis and or inflammation. However, substitution of the methionine residue by leucine in TNFα –converting enzyme, which mediate the release of multiple membrane proteins signaling the effect of TNFα, showed to inactivate TNFα **(81)** and this may explain the ability of leucine in preventing the effects of TNFα.

This study showed that leucine administration to rats of group III partially prevented osteoporosis secondary to cast-immobilization compared with group II. However, leucine administration to rats of group III did not completely prevent the secondary spongiosa osteoporosis of the proximal tibial metaphysis as the case in the gastrocnemius muscle atrophy compared with group I. There were still significant decrease in the mean trabecular bone volume, in mean osteoid thickness and in mean percentage of relative osteoid surface and significant increase in the mean percentage of the relative bone resorption eroded surface in group III compared with control. **Iwaniec *et al.* (82)** noted that cancellous bone formation rate was significantly affected by loading status and weight bearing. Moreover, it was previously reported that complete recovery from disuse may never occur except with return to normal weight bearing **(41)**.

Thus bone recovery depends on muscle integrity so the results of this study suspected that the apparently healthy non atrophied leucine treated muscle in group III appearing similar to control will enhance and complete the recovery of the residual bone effects of immobilization after cast removal and remobilization. On the other hand, the effect of the atrophied muscle on osteoporotic bone in group II will take more time in recovery if it will occur completely.

Conclusion

Increased MDA, Cortisol, TNFα with immobilization may explain in part the associated changes in musculoskeletal system. Leucine markedly prevented skeletal muscle atrophy and partially prevented cancellous bone osteoporosis which could be attributed to its direct anabolic effect or its ability to reduce oxidative stress and /or its ability to counteract the effect of Cortisol and TNFα rather than reducing their levels. Overall, these data suggesting that increasing leucine availability may represent a nutritional strategy for limiting muscle and bone protein loss as a consequence of immobilization.

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The Role of Educational Systems in International Crises: A Reappraisal of Middle East Countries

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Abstract: The worldwide crises and incidents in the two recent decades have made many researchers in different fields of human knowledge describe, analyze and give out solutions for them. Comparative Education as a "science" has been no exception and its latest developments indicate the point that comparativists have conceived a new mission for themselves. The very political nature of these international crises which mainly have educational foundations has caused daily- increasing interest towards the discipline. Today, politicians in particular and many people in general are so eager to know what kind of belief or educational system can give rise to certain political behavior. This political behaviour reveals itself in a way that is unjustifiable as far as rational criteria are concerned. Suicide bombings, attacks on public centres, firing bullets at children and the youth who have just a piece of stone in their hands and blind aimless bombings have made people totally confused. This bewilderment is a global affair and not limited to the developed countries. So the question which is now raised is to ask, firstly, why the youth incline to join into fundamentalist organizations, and secondly, what roles the educational systems play in creation and development of international crises. The response to these two questions can be a new mission of the researchers in the field of comparative education. Awareness and emphasis on the importance of this mission can be found in papers published in famous journals of the disciplin, but there is an obvious lack of a tangible and theoretical analysis. This paper is an attempt to give a theoretical framework to answer the two raised questions in a particular geographical area, namely, the Middle East.

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Keywords: International Crises, Educational Systems, Middle East

Introduction:

During the Cold War period, disputes between the involved governments were considered a political affair which did not have direct impacts on people's daily life. The fall of Communism promised a peaceful period which unfortunately passed by so quickly. The fact that how "the threat of terrorism" could substitute "the fear from communism" is a question that many have not answered yet. Although new crises have , to a large extent, been affected by the politics factor, on the contrary to the past, they have got a new valued nature. The whys of the youth's inclinations to fundamentalist organizations might be found in the conflicts between different types of values. (Sridhar and Arani, 2003) These conflicts have penetrated into families, schools and public gatherings and through social gap have caused people confront others' thoughts. (*cf* Davies, 2005) These intellectual confrontations have made cultural, religious, political and educational systems to oppose their goals. Educational systems are in the centre of these conflicts. (*cf* Smith, 2005) This is true because all of the social systems seek to affect children, teenagers, and finally the whole society through educational system – as a vital tool.

It is obvious that conflicts of values in all societies do not possess the same degree of severity. This is something more tangible in those countries that in spite of their glorious civilization in the past are enclosed with a high thick wall of traditions. (Al Zeera, 2001) Here, The Middle East is involved in a special condition. In recent years, this region has been the heart of many regional and global crises which are deeply rooted in the internal crises of the countries in the region. In this paper, attempts have been made to describe the relationships between different types of values, and to describe their effects on educational systems in the Middle East.

Conflict in spheres of Value

Values can be classified into four major categories: personal, national, religious, and global. The four supporter systems of these categories are families, governments, religious centres, and mass media such as television and the internet respectively .These supporter systems can be called "Pressure groups". (Arani and Sridhar, 2003) Coexistence of these spheres of value at first sight seems to be simple and reasonable while a deeper outlook into the issue indicates that different communicative instances might be present between them. In the positive instance, all four spheres, without any interference, may be aimed at a unique goal which can be called "Human Growth" (Figure 1). In a neutral instance, each sphere assigns a particular behaviour to the

individuals and enforces them to do that (Figure 2). In the negative instance, we witness some kind of conflict between the spheres in which individuals are required to show simultaneous conflicting behaviour. (Figure 3)

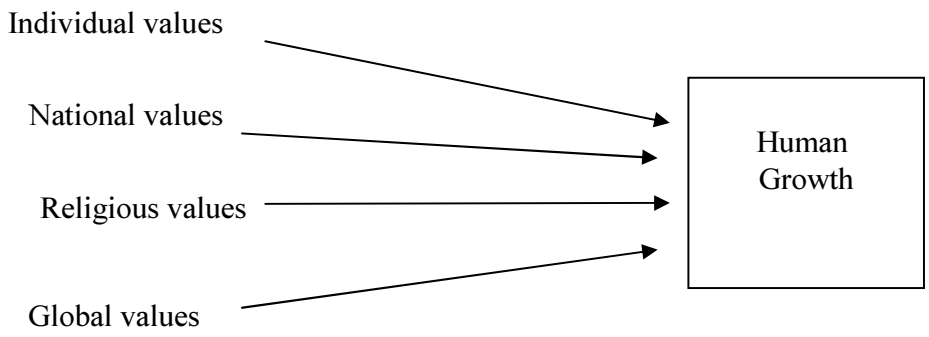

Fig.1: Relations among Values (Positive)

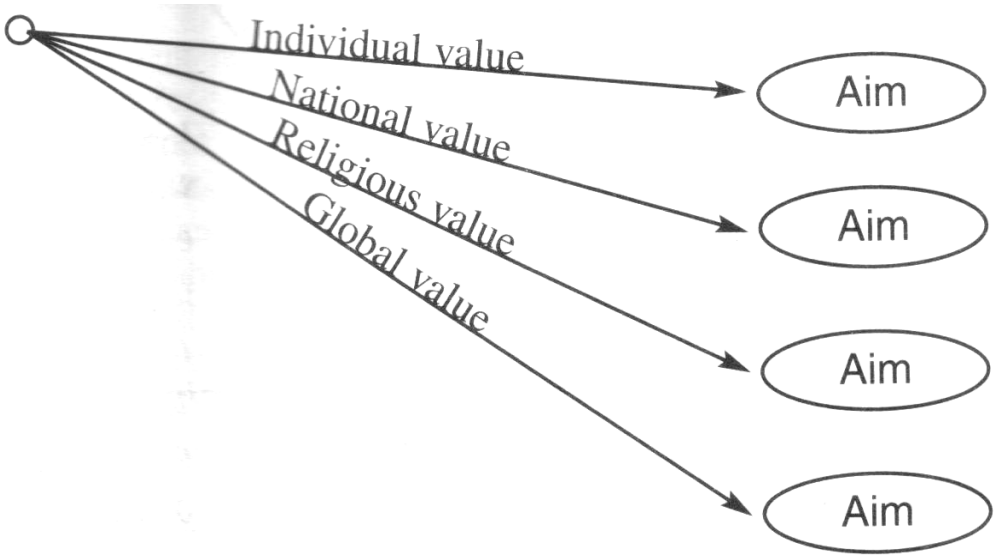

Fig.2: Relatios Among Values (Neutral)

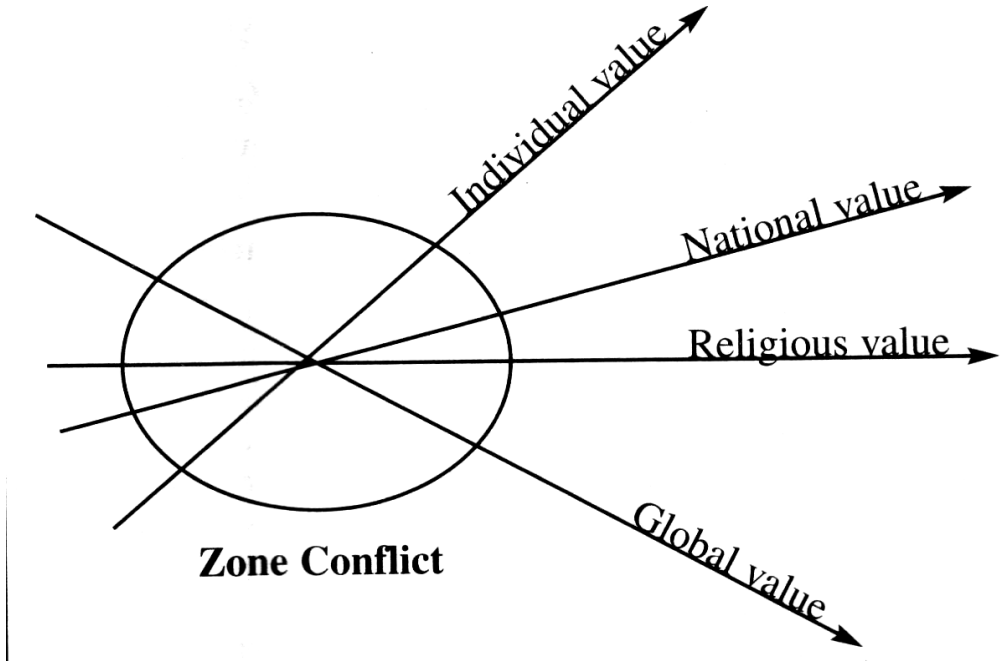

Fig.3: Relations among Values (Negative)

In the real instance, personal values are more directed to the instantaneous and individual interests and may result in egocentrism. National values are also threatened by the growth and development of extreme nationalistic morale and patriotism. Religious values in an extremistic fashion move to the darkness of thought and dogmatism and finally, global values may remain unaware of local and social values. On the other hand, personal and national values are by nature inward looking while religious and global values should be regarded as outward looking. (Jacob, 2001) The basic point in this case is to collate this inward looking and outward looking in order to get to a common field out of the four mentioned spheres of values. Each sphere propagates and supports certain kinds of values and tries to transfer them to the society in order to establish its authority over the society. This might be fulfilled through training the young generation. In such a situation the youth find themselves surrounded by the family, government, religious centres and mass media which are enforcing them. In a superficial analysis each one of the spheres of values should affect the youth separately and equally. But, in reality, there are considerable differences between societies in this respect. We can compare the two geographical areas i.e. the Middle East and the Far East countries to illustrate the matter in detail. This example can help us to find an answer to the first question.

In the past fifty years, the two mentioned areas have been affected deeply by these types of values and experienced a lot of transitions which have ended in different results. These transitions indicate that the kinds of reactions - made by the young generation in these two areas - to the pressures from the fields of values are not the same. In order to find out the reasons of these differences, the role and degree of impressiveness of each of the four spheres of values on these two societies should be surveyed (figures 4 and 5).

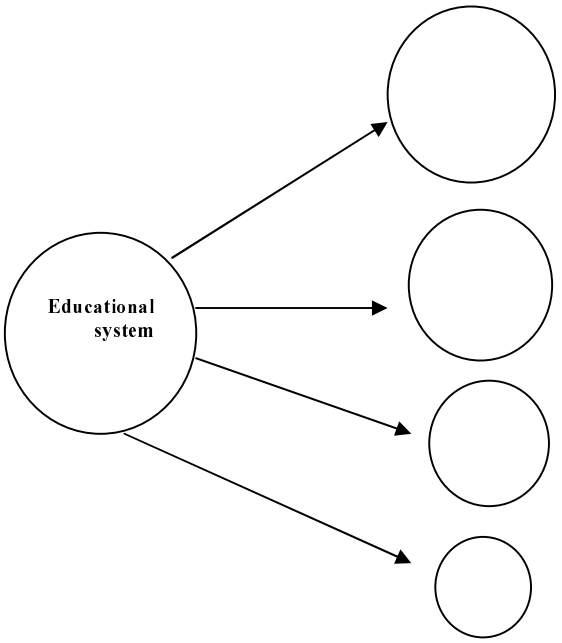

Fig.4: Relationship between educational system and values in Japan, South Korea, Taiwan, Singapore, and Malaysia

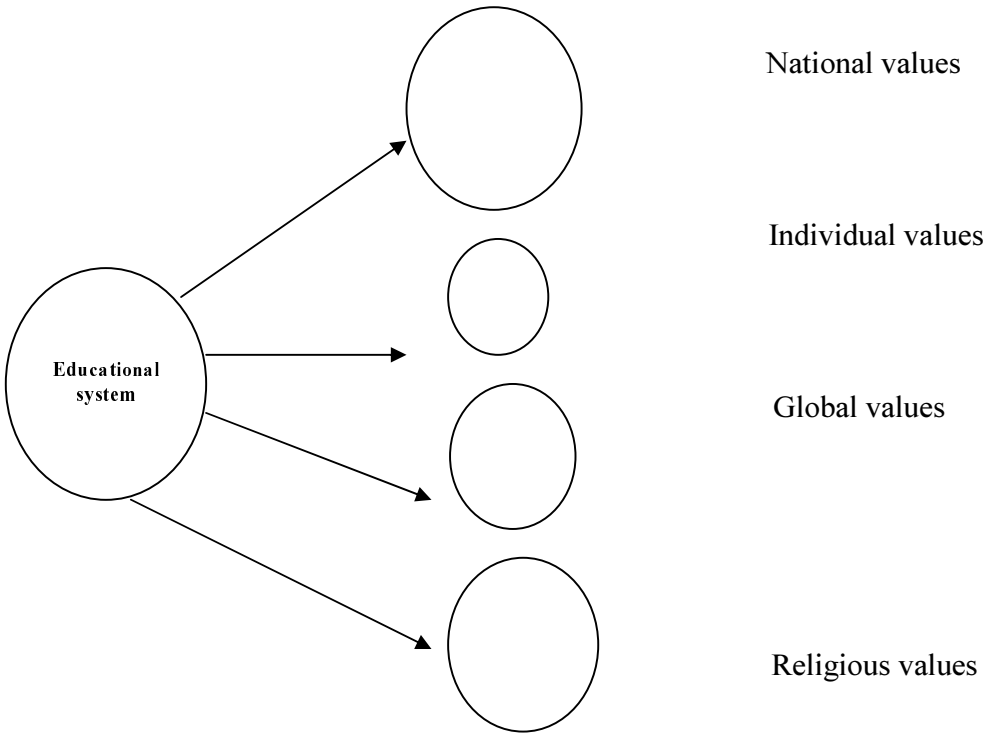

Fig.5: Relationship between educational system and values in Middle East countries

Considering figure 4, we meet a model which shows the superiority of national values in the countries such as Japan, South Korea, Taiwan, Singapore, and even Malaysia during the past fifty years. In these countries national values through the political system (State) tried to affect people's life status. Having encouraged the nationality morale and encouraging the economic competitions and generalizing it to all social activities, the government could make the personal values encourage educational and economical competitions through the institution of family (*cf* Bray and Yamato 2003, Numata, 2003). Moreover, the family system in cooperation with the political system has welcome and peacefully accepted global values. It all happened at a time when religion and religious values played their minor and traditional role. These values, wherever necessary, were put to use in the service of personal and national values as progressive teachings by the men of politics. Now we witness that these countries, abstaining from many crises, could pave their way into development and comfort and avoid extremist bias of their society and specially their youth in favor of one of the values or another.

In the Middle East, on the contrary to the first group of countries, the situation of political system is not so promising. In the majority of these countries there is a kind of gap between politicians and people. (Velloso, 1998) Political and social freedom is limited and there is no sign of real democracy. During the past fifty years, this region has never experienced a sustained peace at both national and regional levels. The lack of political stability has not allowed the real national values to institutionalize themselves for the betterment of people (Kumaraswamy, 2006). Yet, unfortunately, it does not mean that political affairs have not influenced the people's destiny in this region or people have been totally unaware of them. One should live in the Middle East if he wishes to know the most politically-oriented people in the world.

On the other hand, the cultural system of family is in conflict with the global values although affected by daily increasing manifestations of western civilization and specially the globalization movement which encourages personal values. In this situation, the adult generation constantly feels unable to understand the language of the children and therefore put them under pressure with the result of appearing "gap between generations". This is the phenomenon proposed by parents, educationists and family sociologists in the mass media in these countries. The weakness of national values, attacks of personal values on social relations and the development of personal profiteering on the one hand and the daily increasing pressures of global values which are in conflict with national and religious values on the other hand have caused all people in these countries to encounter critical conditions.

Having all these in mind, now, we can, to some extent, answer the first raised question which asks for the reasons of the youth inclination to fundamentalism in the regions like the Middle East. We witness that the family, government (schools and universities), commercial companies and even religious centres have put children, teenagers and the youth under pressure and engaged them in certain conflicts **(**Mazawi, 2004). On the one hand, families expect children to respect their cultural and religious beliefs behave the way their models did. Children are also asked to overlook the models imported by the media like the television and internet. On the other hand, as far as economics is concerned, both families and the elitist system of economics expect them to get higher educational degrees and find themselves suitable positions in the competitive world of jobs as soon as possible. In spite of their attempts in getting their higher degrees, the youth's unemployment is attributed to their own weaknesses by their families. Here, the youth are found guilty in stead of the economic system which lacks the job-creating power. The political system, in cooperation with families, trade companies and religious centres and sometimes in contrast with their preferences, seeks its goals, making the youth tools in its hands. In such a situation, the youth react differently based on any one of four types of values. Escape from home, the youth's inclination to violence in educational environments, alcoholism and drug addiction as well as the growth of different crimes and non humane behaviour are just a part of the youth reactions against the pressure of cultural system and personal-global values (Davies, 2005). The increase of false jobs and attempts to gain utmost profits in a short time through disobeying the economic rules and migration to the large cities or the European and American countries are some of the youth's reactions against the pressures of the economic system and personal-global values. (Arab Fund for Economic and Social Development, 2003) Blind obedience to political authority, joining into opposing political parties and inclination to violence and armed struggles against the government and the party in power can all be taken as some manifestations of the youth's reactions against the political system and national values. The elimination of religious values of the society, extremism in religious beliefs and the lack of tolerance for meeting different religious

ceremonies and making new religious heresies can be regarded as a number of reactions used by the youth in the Middle East countries to fight against the pressures of religious system. (Stover, 2005) Each one of these reactions causes new social crises at both national and international levels.

Educational systems and International crises

In order to understand the relationships between the educational systems and international crises, it seems necessary to express what is meant by "educational system". This term has been used in many published papers in the journals related to the field of comparative education in a very broad sense. (*cf* Crossley 2000, Dangor 2005, Davies 2005) It may cause readers to misunderstand the realities of the issue and form a false concept of the relationships between educational systems and international crises in the regions such as the Middle East. The application of the term "*educational system*" in a general sense prevents us from distinguishing between **Formal Education** and **Informal Education**. While many existing problems in regions like the Middle East are the results of the performance of the Informal Education, the Formal Education is to be accused of them. Therefore, we must distinguish between these two systems of education if we are to explain the role of educational system in the youth's inclinations to fundamentalist organizations. Another mistake that should be avoided is that we consider the political system (the government) as a superior institution over both the formal and informal educational systems in all of the countries in the region. (Arani, 2003) It should be pointed out that true understanding of the role and position of the political and educational systems in international incidents would require the true understanding of the different connections of these systems in different countries of the region (figures 6, 7, and 8).

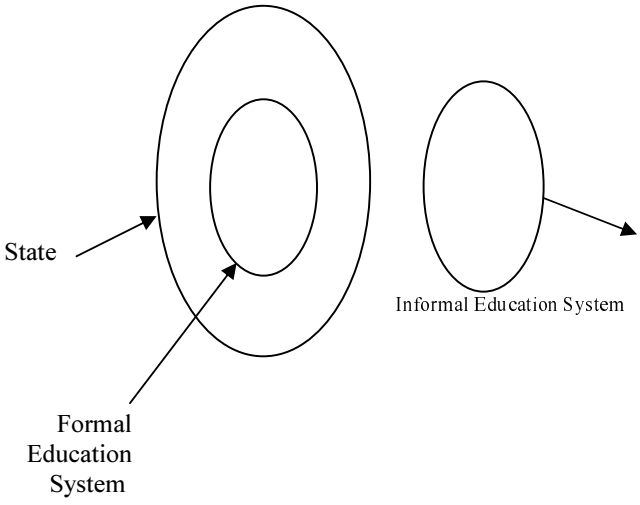

Fig 6: Relationship between State, Formal and Informal Education Systems in Turkey and Pakistan

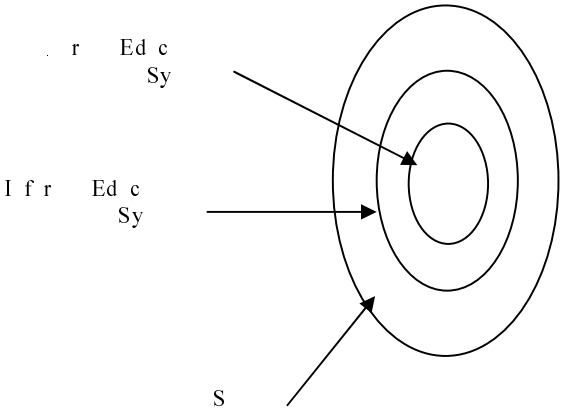

Fig. 7: Relationship between State, Formal and Informal Education Systems in Israel

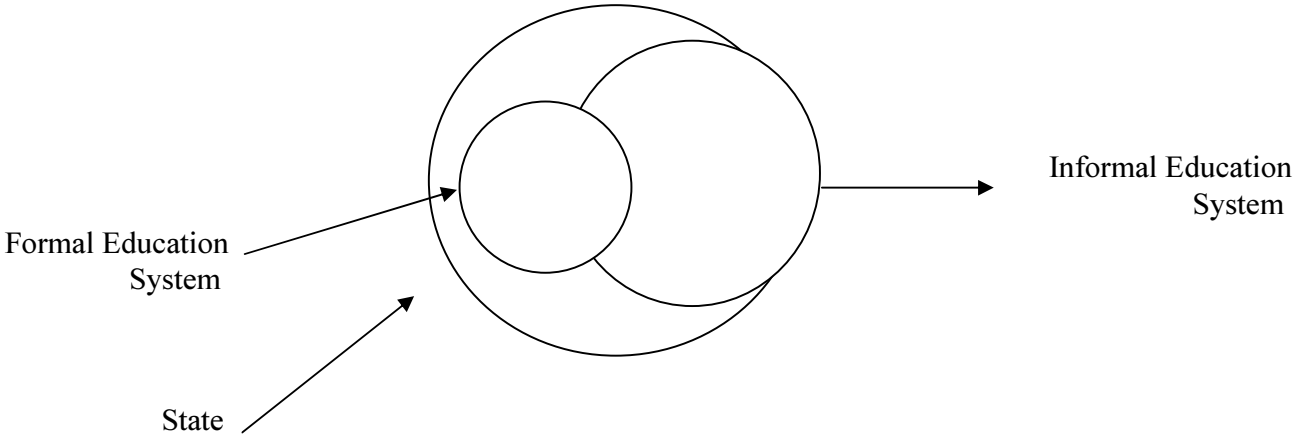

Fig. 8: Relationship between State, Formal and Informal Education Systems in Arab countries

Figure 6 shows that in countries such as Turkey and Pakistan the formal education is in total control of the political system, whereas the informal education has no relations with formal education. For example, in Pakistan the regime in power poses some ideas and beliefs which are not accepted by the religious and cultural system. (Kfir, 2006) In such cases, the religious system tries to, through informal education, establish special schools and family-based religious associations in order to neutralize political teachings. This is the case that we witness instructing controversial teachings of informal education which are in conflict with that of formal education, and it causes a kind of bewilderment and uncertainty in the youth which reveals itself as the "*conflict of values*". In fact, children and the youth acquire the teachings which are not taught at schools and because these instructions are usually against the goals of national and international values, violent reactions may appear from the side of political system. This violence makes the differences deeper and more severe (for example, we can mention the clashes and political insecurities in Pakistan when the government closed down the religious schools). The second example can be what has been called the problem of veil in Turkey. Here, we see the conflict between the political system and formal education on one side and the informal education on the other side in this country. The formal education supported by the government propagates secularism at school and university environments, and separation of religious and cultural beliefs from the realm of children's education while the informal education with the support of religious system and institution of family tries to quarrel in this battle. (Arjmand, 2006)

In the second state (figure 7), the political system (State) has a full authority over both formal and informal education. Israel which is in complete political opposition is interesting case. In this country the informal education is a real supporter of the political system and formal education. In this case, it is better to say that politicians are religious theologians or religious theologians are politicians. (Abootalebi, 2001) Therefore, both groups believe that cultural and religious teachings must be executed through the formal and informal educations.

In the third state (figure 8) we observe a situation which is true in the Arab countries of the region. In Saudi Arabia, Qatar, Kuwait, Jordan, and the United Arab Emirates, the political system has a complete control over formal education, and the schools are , mostly, dependent on the government. Although the interventions of non-educational institutes (mosques, religious schools, and families) are considered illegal, the informal education system tries to apply its teachings through contacts with political system. In this condition there is a kind of peaceful coexistence between these two systems which support each other whenever necessary. (Wiktorowicz, 1996) In fact, in these countries the informal education via some

centres (such as religious schools, parties, and families) tries to take the responsibility of those affairs that the political system is not able or willing to instruct openly in formal education. (Bayat, 2002) As an obvious example for this cooperation, the role of religious schools in training, equipping and sending Arab forces to Afghanistan to fight against The USSR should be sought out.

The existence of different types of values on the one hand and different methods of communications between the political system and formal and informal educations on the other hand makes it clear that there will be some difficulties in finding appropriate quick answers to our questions. According to the diagrams 6, 7 and 8 there are three groups of countries. In the first group, the countries do not allow the educational system to involve in social crises believing the separation of education from politics. Although these countries are suffering from internal problems which result in "gap between generations" or intensifies conflicts between religious system of family and political system, the political system is so strong that it does not allow people to play any role in creating international crises. This is the reason why one can hardly ever find a citizen from Pakistan or Turkey committing a bombing suicide outside of the boundaries of his home country. In the second group of countries, politicians, religious and cultural leaders like Plato consider the education and politics as the two sides of a coin. Although the leaders of the societies which are influenced by the globalization movement observe the youth cultural transformation day by day, they do not allow their citizens to play any role in creating international crises and may do it themselves if necessary. Therefore, you can not find any trace of involvement of Israeli citizens in international crises, in spite of the large number of these crises in the recent decades. In the third group, the political and educational systems deny their roles in the political crises but it is obvious that they have had some kind of involvement in these crises. In this situation, administrative organizations, parties, religious schools and families are strongly engaged in cultural, religious and political disputes at all three levels of national, regional and international.

In addition, the role of the citizens of these countries in conflicts of values at an international level should not be overlooked. It is natural that conflicts in the spheres of values are not limited to the ethnic society. When we consider the phenomenon of immigration from the Middle East to Europe which is affected by the role of global values, we come to the idea that the way that immigrants of these countries accept the culture and the values of the host society is different from each other. (Kepel, 2004) Events such as the riots of Paris - disregarding the economic factors which caused them to happen – indicate different roles of immigrants from the Middle East. Why did the immigrants from Turkey, Iran and Pakistan play the least role in these riots?

The role of Comparative Education

From the whole discussions above it can be concluded that answering the two raised questions in this paper requires more studies and surveys. These surveys must be done by those who, in addition to the knowledge of comparative education, should be well aware of the cultural, social and religious aspects of the society being studied. The researchers must recognize the differences and similarities between countries. It can be a new mission for the researchers in comparative education. They should – through their scientific activities – develop a new insight that others realizing the existing religious social and cultural differences avoid the overgeneralization and too general judgments. Nothing is more boring than the time when you see some researchers of comparative education pay attention to just one common factor of religion or culture-e.g. belief in Islam- at the expense of other aspects of people in the Middle East. In a situation like this, we may find it necessary to develop a new interdisciplinary course such as "*Regional Comparative Education*". The present paper has tried to illustrate that there is a large variations in the relationships between political system and educational systems in the Middle East.

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Status of rural people in Participatory Rural Appraisal (PRA)

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Abstract: PRA consists of a series of participatory exercises which help community members better assess their history, resources, and overall situation as concerns agriculture, health, marketing, credit, coping mechanisms, education, and other important areas. During the conduct of the PRAs, rural communities in the selected villages will gather information on the resources they already possess; organize their knowledge; share experience among themselves; learn from each other; identify and prioritize local development needs; and develop action plans which respond to these needs. The aim of PRA is to help strengthen the capacity of villagers to plan, make decisions, and to take action towards improving their own situation. Participatory Rural Appraisal (PRA) is considered one of the popular and effective approaches to gather information in rural areas. This approach was developed in early 1990s with considerable shift in paradigm from top-down to bottom-up approach, and from blueprint to the learning process. In fact, it is a shift from extractive survey questionnaires to experience sharing by local people. Much of the spread of participatory rural appraisal (PRA) as an emerging family of approaches and methods has been lateral, South-South, through experiential learning and changes in behavior, with different local applications.
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Keywords: participation, rural people, Participatory Rural Appraisal (PRA)

Introduction:

RRA was criticized for being extractive and highly dependent on expert interpretation. It was thus found useful to replace it with PRA which involves a process of learning from, with and by rural people about rural conditions. PRA shares much with its parent, RRA, but is distinguished from it in practice by correcting two common errors: roles of investigation are reversed; and rushing is replaced by relaxation and rapport. At the heart of all these developments was Robert Chambers, although Paulo Friere has also had strong influence especially in similar developments in education circles (Provention Concertium). In the context of rural development, information regarding the communities, their livelihoods, their beliefs, the physical environment in which they live, and their resource endowments need to be gathered and interpreted in a manner that identifies their priorities with a view of developing better understanding of their status and designing appropriate intervention projects directed at resolving their problems. The different ways of data collection and interpretation can be seen under two perspectives (IUCN, 2001): qualitative versus quantitative, and participatory versus top down. While the quantitative methods generate information that can be captured numerically, the qualitative methods generally do not generate specific numbers. Qualitative methods are concerned with exploring meanings, processes, reasons, and explanations (lnglis, 1992).

PRA techniques(Gibson, 1992):

The most common methods are the following:

1- Diagramming, Mapping and Modeling:
- transects
- maps (resource, social, farm)
- venn diagrams
- seasonally analysis
- historical analysis (time lines, trend lines, activity profiles)

2- Ranking and scoring
- pair wise ranking
- matrix ranking
- matrix scoring
- well-being analysis and wealth ranking
- proportional piling
- pie charts (injera charts)

3- Problem analysis
- identification and specification
- causal chaining
- prioritization

PRA has evolved and spread from beginnings in Ethiopia, India, Kenya, Sudan and elsewhere, and in early 1994 is known to be being quite widely practiced in parts of Bangladesh, Botswana, Ethiopia, francophone West Africa, India, Indonesia, Kenya, Nepal, Nigeria, Pakistan, the Philippines, Sri Lanka, Sudan, Uganda, Vietnam, and Zimbabwe, while starts have been made in at least a score of other countries in Latin America, Africa and Asia. Hundreds of nongovernment organizations (NGOs) have adopted PRA and

developed applications, as have a number of government departments. The use of PRA methods is being increasingly explored by students and faculty in universities for research, and by training institutes for fieldwork. Spread appears to be accelerating.

The objectives of the PRA are:

• to enable rural people to organize their knowledge, share experience among
themselves and gather information on resources they have
• to understand the rural environments and social as well as economic
dynamism
• to understand the trends in the rural socio economic conditions
• to enable the community identify their problems, causes of these problems and
possible solutions
• to enable the community develop a community action plan to address their
problems

In order to limit the PRA to the objectives set and to have consistency in conducting the PRA in the different villages, a PRA manual was prepared by the socio economic team. In line with the manual, emphasis was accorded to the following topics:

1) Village History. The first day of the PRA discussion begins with history of the village which enabled participants to easily and comfortably tell about the history of their village.

2) Agriculture and Livestock. Focus group discussions were made on agriculture and livestock rearing practices including the problems encountered and possible solutions.

3) Social service. The provision of social services like education and health including the associated problems were also discussed in focus group discussions.

4) Village institutions. Institutions, both from within the village and outside, as well as formal and informal with which the rural communities interact have been addressed.

5) Trend lines. Trends in food availability, forest, population growth, wealth, rainfall and poverty are addressed in this section.

6) Wealth ranking, problem analysis, and community action plan. Finally, the participants ranked the community on the basis of its wealth, discussed the major problems and formulated action plan. The PRA is to be followed with a more quantitative and structured socioeconomic survey, which will then be followed by specialized researches in specifically selected areas; notably, poverty and coping mechanisms, microfinance, marketing, utilization and management of natural resources, and gender.

At the end of the 1980s, Participatory Rural Appraisal was developed in response to the too mechanistic and extractive implementation of RRAs. In PRAs the target group is encouraged to learn and the role of outsiders is reduced to a facilitator of the learning process. PRA aims to empower local people by encouraging them to share, enhance and analyse their knowledge of life and conditions and to plan, act, monitor and evaluate.

As with RRA it is hard to define what exactly a PRA is (some even prefer not to define it and just refer to “a family of approaches”). PRA shares the basic principles of RRA (quick, multidisciplinary, observations, etc.), yet now it is the local people who are encouraged to analyse their own situation and plan activities to improve it. The three basic pillars of PRA (and the basic differences from RRA) are:

1. the behaviour and attitude of outsiders, who facilitate rather than dominate;
2. the methods, which are open, group-oriented, visual and comparative;
3. sharing of information, food, experiences, etc. between in- and outsiders.

For the tools used, two issues stand out:

1. ‘Handing over the stick’: instead of outsiders trying to understand the knowledge of the local people, PRA tries to facilitate local people to develop their capabilities. They collect and analyse the data and propose actions to be undertaken.
2. Visualisation and sharing: local people convey their ideas and knowledge in a visual way. In verbal communication, outsiders dominate the dialogue more easily (via eye contact, cross-checking, etc.) than in communication via visual aids. When a map is drawn by a stick in the soil all can contribute, and local people feel more confident than when outsiders try to draw a map on a piece of paper with a pen - a typical tool of powerful outsiders. Sharing also explicitly involves the food and shelter during the PRA.

The most commonly used tools are:

- participatory mapping: a group of villagers makes a map of the community. The way they do this and what they find important provide good entry points for discussions about crucial aspects of village life;
- village transects: together with a (small) group of villagers the team walks through the village (or another relevant area) and discusses the things observed;
- ranking: people are asked to compare units (e.g. families /trees /crops) and to group them according to their own criteria. For example, via pair-wise comparing the importance of certain trees, people

find out which criteria they use to assess the usefulness of these. Ranking is also used to stratify the local population, e.g. via wealth ranking. Both the results of the ranking and the criteria used provide entry
points for further discussions.
- historical recalls: the lifestory of families are recalled and the main events are used as reference points in the analysis of the present situation;
- calendars: people indicate how things change over time, e.g. in which months they have to borrow money, when their children get malaria, when the rains are normally expected, etc.

Combining information obtained from all the tools provides the villagers with an explicit picture of their daily life. This not only helps them to start a discussion on their main problems and how to tackle them, it also boosts their self-esteem because they are able to make this analysis themselves.

Five key principles that form the basis of any PRA activity:

1. **Participation:**

PRA relies heavily on participation by the communities, as the method is designed to enable local people to be involved, not only as sources of information, but as partners with the PRA team in gathering and analyzing the information.

2. **Flexibility:**

The combination of techniques that is appropriate in a particular development context will be determined by such variables as the size and skill mix of the PRA team, the time and resources available, and the topic and location of the work (Dunn, 1991).

3. **Teamwork:**

Generally, a PRA is best conducted by a local team (speaking the local languages) with a few outsiders present, a significant representation of women, and a mix of sector specialists and social scientists, according to the topic.

4. **Optimal Ignorance:**

To be efficient in terms of both time and money, PRA work intends to gather just enough information to make the necessary recommendations and decisions.

5. **Systematic:**

As PRA-generated data is seldom conducive to statistical analysis (given its largely qualitative nature and relatively small sample size), alternative ways have been developed to ensure the validity and reliability of the findings. These include sampling based on approximate stratification of the community by geographic location or relative wealth, and cross-checking, that is using a number of techniques to investigate views on a single topic (including through a final community meeting to discuss the findings and correct inconsistencies).

Conclusion:

Kamla Bhasin (1999) suggests that development practitioners should constantly ask themselves: “am I increasing the confidence of the poor, their faith in themselves, and their self – reliance, or am I making them instruments of my own plans of action, imposing my own ideas on them and that of my organization and/or institution?” Social Development is a process of gradual change in which people increase their awareness of their own capabilities and common interests, and use this knowledge to analyse their needs; decide on solutions; organize themselves for cooperative efforts; and mobilize their own human, financial and natural resources to improve, establish and maintain their own social services and institutions within the context of their own culture and their own political system. To give effect to this understanding of social development, participation of communities in their own development is important. The participatory approaches, including PRA provides first step/stage in sustainable community development.

As a result of the PRAs, the communities are expected to attain many benefits including:

• Expressing their own ideas and concerns;
• Organizing their knowledge about the past and present;
• Identifying as a community their problems, the causes of these problems and
possible solutions;
• Developing a common plan to address these problems;
• Developing the ability to use their own resources more effectively and attract
more resources from the outside.

The academicians/researchers involved in the PRAs are expected to get the following
benefits:

• Developing better understanding of rural environments and social as well as
economic dynamism taking place there;
• Appreciating the fact that communities are capable of analyzing their problems
and outlining possible solutions to their problems;
• Participating in designing possible solutions to community problems;
• Utilizing the results of the PRA work as a research output for publications and
presentations;
• Building their research and problem investigation capabilities;

• Supporting their classroom discussions to students with practical examples from the PRA findings.

The main objectives of the current PRA are:
1. empowerment of rural communities by assisting them to systematically utilize their local knowledge to identify problems and strengths, develop skills of analysis, and design appropriate mechanisms for intervention by themselves and/or by development agents;
2. advancement of understanding by academicians/researchers of local knowledge and acknowledgement of the capacity of communities to gather data, conduct analysis, and identify as well as prioritize problems and solutions;
3. utilization of the research questions/problems identified during the PRAs for further investigation;
4. documenting and presenting the outcomes of the PRAs to development agents (governmental and non-governmental) and other stakeholders so that they could undertake interventions in line with the findings.

PRA consists of a series of participatory exercises which help community members better assess their history, resources, and overall situation as concerns agriculture, health, marketing, credit, coping mechanisms, education, and other important areas.

During the conduct of the PRAs, rural communities in the selected villages will gather information on the resources they already possess; organize their knowledge; share experience among themselves; learn from each other; identify and prioritize local development needs; and develop action plans which respond to these needs.

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The role of micro-credit in improving financial situation of rural women

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Abstract: Rural women are considered as a noticeable potential in the community either directly (crops production, livestock, handicrafts, cottage industries) or indirectly by helping the agricultural sector (as labor). About 5.6 million women are involved in agricultural production, and activities related to planting... harvesting, preparation of animal food, and taking care of livestock and poultry and some certain activities related to trading and marketing are all different fields of rural women's role and participation. Based on current statistics, women in rural area participate about 50% in conversion industries, 22% in producing crops and livestock, 75% in handicrafts and in areas related to planting…harvesting , respectively, 25, 24 and 4.26. And also in activities related to livestock, they handle 23% of livestock grazing, 42% of animal care and 100 percent of total poultry in the village. Therefore their role in achieving food security is undeniable. But, like most developing countries, this crucial role in society and in process of rural development, is not obvious. In Iranian rural community, about 80% of women work, but they are mostly considered as housewives, unpaid employment, domestic workers, family workers, or independent employers. The statistics often do not take into account seasonal, part-time, unpaid employment, and housekeeping activities. In economics and social sciences, those of women's activities that have emerged out of house and affected national economy, are the ones to be noticed. In most research and statistics men are known as the heads of household and they are also the owners of lands and fields. That only 1% of the rural lands are belonging to women does confirm such matter.
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Keywords: empowerment, rural women, micro-credit

Introduction:

For an active participation of women in development, first we need to give a definition for their role in development and then barriers related to their role will be discussed. Although apparently there is no difference of gender in development programs but reality is that women are less considered in participatory programs and most of these plans are planned for men. Finally, planner's optimistic look toward women's participation will be greatly helpful improve rural family budget and will increase the difference between urban and rural families. If, by credit, loans and other financial facilities, rural families are able to build up their own business and make a living through the income and become financially self-reliance or independent, no doubt we will witness some social, economic and cultural changes in villages (Varzgar and Azizi, 2001).

Rural women constitute about half of the world's population and in the world production supply they have energetic communion and constitute a great part of agriculture workforce. They constitute% 50 of the workforce and they participate in the production of half of the foods in the agriculture section. As an example the rural women constitute about 70 to% 80 of agriculture workforce in sub-Saharan Africa, %65 in Asia, %45 in Latin American & Caribbean, %80 in Nigeria & Tunisia and %80 in India, but their role in production system is the men's supplements roles and this causes a big responsibility inside their mother & wife duties and it takes a great time and energy of them. Studies in this field show that women spend about two thirds of their time for production, management & organize of their house as the men spend only one third of their time for such things. (Varzegar & Azizi 1367).

In the development countries, rural societies which are poverty for geographic reasons such as being far from urban societies or because of mountainous of zone and also as the roads are impassable and some other reason, they became deprived of many human development programs. Unfortunately these societies are suffering of mortality because of poverty but what is clear here is that we can't attribute such privation to geography and nature of the zone. Every country is tying to solve such critical conditions by applying depoverty policies. (Bakhshoodeh and Salami, 2005).

Poverty spreading in village is a global issue. According to the Fao finding about % 75 of world's poor people that are more than 1 milliard people are living in rural zone and more than % 70 of this poverty people are women. As the most of the people who are poor are living in village and are women is the reason for insufficiency of rural development programs.

One of the other basic barriers in development of rural women is their independent

inaccessibility to get credits for investment in their job. Although their illiteracy is the big barrier to use of bank credits, but this view that women are dependent people that their husband should decide about their financial decisions is the other reason that rural women couldn't access to official credits. Maybe these barriers are the reason why rural women are happy about applying micro-credit thought in village. (Najafi, 2007).

It is possible that rural women's financial self-reliance made some crudities (malformations) in the family for a short time, for example, rural women became proud after financial independency and find the independence & Excellency sense in themselves but such problems will be small and for a short time.

Empowering rural women:

Empowerment is capacity that woman can obtain in cultural and social environment, for economic independency and self reliance, by controlling over emotional decision making and far from violation. Empowering means, evolution and developing activities through non governmental organizations (NGOS) that lead empowerment to improve economic dimensions. (Amiri, 2000)

Enabling is process that, during it, people of society do activities to overcome barriers of advancement that finally cause their domination to determine their own density. The term “enabling” means overcoming fundamental inequalities. So it is different from self-reliance. (UNICEF, 1997)

Enabling, enables individual to overcome any problematic condition and consider barriers and problems as part of life and positive campaign. Finally, enabling provides energy to overcome most intellectual barriers and external problems at private life.

Thus, among all what have been said, it is possible to present suitable definition of enabling women, as follows:

“Process of explaining women about themselves (and also men about them) for instances that they must or want to do, and growth of their willingness and courage until they reach to needed competency “(management of rural and tribal women).

it should be noted here, that major factor which should be considered about women’s ability, is eliminating individual and social barriers, and finally preparing field of economic and social participation for women at all fields. purpose of women’s participation, is because of their dominance on all affairs of village including decision making process , organizations, forums, enterprising posts and … that involve, participation at all social and economic dimensions.

The rural women's self-reliance has positive effects which is useful for women and their family and also will help their economic improvement that we will mention some of them. (Chowdhury, 2005).

Self-reliance and financial independency:

The income of the rural women makes them financially independent. The financial independency will let them to spend their wage in the ways that they like. Of course their dependency to their family won't let them to spend their wage out of their family needs. Because of this, their financial independency will let them and their family to be self-reliance. (Ghaffari, 2000).

Change economic behavior:

Although we are familiar with the rural women's role in the village and family's economic, but they direct & indirectly start a new economic relation, with finding modern jobs & financial independency. Catching loan from financial organizations has forced them to have economic schematization for loan reimbursement and to have intellectual economic behaviors. So after that rural women become active in economic activities. In rural traditional economic, women only have productive role and they don't have any role in economic planning, providence and they don't pay any attention to profits and losses. But in this new condition, for managing affairs in best way, the women have to be active in all of the affairs from production to dispense and also in others economic aspects. In other words, women will not be a productive only; they will contribute in managing of economic activities and will find various economic behaviors. (Araghzadeh, 2002).

Independency:

The rural women will not dependent economically to their father or husband because of financial independency, this independency is very important to women who have children or they have lost their husband, because the financial problems have forced the rural women to have marriage which is not suitable for their children & themselves. Although the women can solve their financial problems with this kind of marriage but they will have many cultural, social & mental problems. If these women could manage their life with having a job, they can improve their family & kinship's relation.

The rural men & women should notice that their financial independency is not the meaning of an independency in their family, social & cultural affairs and making consensus between financial & economic

affairs is necessary for family's consistency. (Fiona Steele et al, 2008).

Help to economic growth:

The rural women's financial self-reliance will increase their motivation for finding a good job. As a result our rural & urban society will develop by working of women. And it will help direct & indirectly to our society's economic development. As the women constitute about half of the rural & urban's population, so by increasing their production, our society will develop economically. (Jameela, 2010).

Discussion and results:

Although in recent years rural women have participated more in villages' management, social and cultural organizations, and cooperative institutions' management; but having a lower level of literacy, education, income and social status than urban women they still have the smaller share of administrative and official jobs. Some barriers to women's participation which can be categorized in 3 groups of personal, familial, and social include: law literacy level, large volume of work both inside and outside of home for many reasons including seasonal migration of men and the great diversity of rural women's activities(nursing, housekeeping, agriculture, handicrafts, livestock,…), malnutrition, law health indicator, Patriarchal structure of society, father or husbands disagreement with a woman's participation in social and economic activities for various reasons like cultural reasons or unwilling to lose the labor force at home, negative attitudes towards women's abilities, gender discrimination, family's poverty, superstitious beliefs, misleading customs like fatalism, law access of women to credit and facilities, inaccessibility of extension services, men-orientated social activities and participation plans, deficiency of professionals needed to educate rural women, problems of access to health services and social facilities, low income of rural women compared with men, lack of non-governmental organizations dealing with rural women's problems, few women managers in rural area. (Rahimi, 2001)

Nowadays, micro-credit and micro-financing have changed people's lives; it has brought back life to poorest and richest communities of the world. So we can easily observe a great increase in people's access to general financial services. Facilitating the access of families to financial services, they begin to invest on educational expenses, healthcare, healthy nourishment, trading, and housing based on their priorities. Overall in many countries financial plans mostly focus on women. Women, provided with financial facilities, will receive a loan, guarantee to pay it back, keep their saving account and also they'll have insurance coverage. Micro-financial plans have an important message for families and communities. Many studies have proven that women's access to mentioned facilities may improve their conditions in family and society; it also helps them feel more self-confident and makes them aware of their own abilities. Thus providing micro-credit services for the poor in society is a powerful tool to reduce poverty and so that they are able to create assets, earn more money and become less vulnerable against the economic pressure. Of about 1.3 billion poor in the world there are 900 million poor women, this obviously shows that poverty has a feminine face. According to UN's development fund, 10% of world's income and less than 10% of world's assets belongs to women. While a majority of them never posses the capital needed for their activities, women still play an important role in the economic development of country. Therefore women draw the micro-credit policy maker's attention more than others. Choosing women as the main target of micro-credit plans is an effective strategy to eradicate poverty; because their income will upgrade the family welfare; furthermore earning money improves their social status. In some countries this choice is influenced by society's attitude and culture (Araghzadeh, 2002).

For instance founder of Grumman Bank of Bangladesh, Mohammad Yunes, has stated that: "women have plans for themselves, their children, and their family life; they always have an overlook while men just look for fun" to explain why 94% of their clients are women.

Women's access to micro-credits have shown that their income benefit to improve their family and provide livelihood. In addition to all these another reason of women being the target of micro-credit plans is that women have higher loan recovery rates. Totally, expanding women's access to micro-credits may lead to many useful results which in economy is mentioned as "virtuous spiral"; because their access to micro-credits results in family welfare and in a broader point it'll improve community's welfare and shall be increased welfare this process is repeated.

Ellen and her Colleagues (2009) used approach called it "credits and education at Bolivia, Ghana, Honduras, Mali and Thailand". This approach looks for empowering women through financial services with education. In this approach, women get familiar with importance of credits through education and extension and also familiar with ways to access it through establishing different groups.

Ruhal Amin and others (2010) found that those who joined credit funds had more ability rather than those who didn't.

Jameela (2010) presented that credit programs has shown lot of affects on empowering women so that has increased their social, politic and economic ability.

Thus it is obvious that credits programs and its educational and empowering programs can be affective on social, humane and economic development or rural society, if it be associated with proper and gradual practices and base on reciprocal communications principles and apply opinion of local society.

A study conducted by Chabokru et al (1384) shows the crucial importance of micro-credits for farmers who do not possess physical financial assets (land, building, livestock, well…) and work in agricultural sector because of environmental conditions (such as living in a village) or because it's their ancestral occupation.

So today, women's participation in sustainable economic, social, and cultural development in rural areas is not optional but an essential matter. Those communities that have not seriously considered the necessity of participation faced failures and delayed community's development, welfare and security process. In any community, village, or social group, broad participation of every women in decision-making and any other matter related to national or local development programs, is a key variable in social sciences and in the last few decades, it has interested many scholars of socio-economic and especially cultural issues, and is considered as one of the most fundamental democratic rights of women in a society.

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5/10/2011

Some techniques in Participatory Rural Appraisal (PRA)

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Abstract: Chambers (1992) has defined PRA as an approach and methods for learning about rural life and conditions from, with and by rural people. He further stated that PRA extends into analysis, planning and action. PRA closely involve villagers and local officials in the process. PRA is a methodology of learning rural life and their environment from the rural people. It requires researchers / field workers to act as facilitators to help local people conduct their own analysis, plan and take action accordingly. It is based on the principle that local people are creative and capable and can do their own investigations, analysis, and planning. The basic concept of PRA is to learn from rural people. There are a wide range of participatory tools and techniques available. People can use these tools and techniques according to their situation or needs. Generally, the application of different tools may vary from one situation to another.
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Keywords: Participatory Rural Appraisal (PRA)

Introduction:

The most common methods are the following:

1- Diagramming, Mapping and Modeling:
- transects
- maps (resource, social, farm)
- venn diagrams
- seasonally analysis
- historical analysis (time lines, trend lines, activity profiles)

2- Ranking and scoring
- pair wise ranking
- matrix ranking
- matrix scoring
- well-being analysis and wealth ranking
- proportional piling
- pie charts (injera charts)

3- Problem analysis
- identification and specification
- causal chaining
- prioritization

-Direct observation –

Observations are related to questions: What? When? Where? Who? Why? How?
- Observe a particular topic or theme for a particular piece and time
- Record observations as soon as possible
- Guidelines for making observation
- Decide on the major theme or topic to be observed
- Decide before hand where observation will take place. When and how long you will observe(Pottier, 1992).

Maps and Models – Diagrams:

Spatial data is analyzed through diagrams, maps and models. The techniques are pictorial or symbolic representation of information.

Procedures for collecting spatial data

Who draws the maps?

The community members of their representatives together with the PRA team and the local extension field staff undertake this exercise. The various parties having different but complementary ideas to the process.

The community members are the best experts of their area. While it is tempting for a team member to take charge and save time by drawing the

map, it is advisable to let ordinary villagers draw the map on the ground. Literacy is not necessary in order to draw a map of one's place. The PRA team should explain the process clearly. The sketch map is drawn using their fingers, sticks and other locally available materials such as pebbles, leaves, and flowers. The community should be guided through questions to draw the map of their community territory of application(IUCN, 2001).

Community sketch map helps in defining micro-zones, knowing about disparities in wealth, differences in land use. This exercise provides to locate areas where particular problems are thought to be prevalent. The map is also used to lay the transect route. While the map is still on the

ground the community members mark the most representative cross section of the community.

How should one proceed to sketch maps or models?

Before:
- Decide what type of map you want
- Bring people together who will have some knowledge about the area and can contribute
- Choose suitable time and place
- Bring materials with you on which you can copy a map drawn on the ground(Scoones, 1993).

During:
Try to minimize your own participation be an observer?
- Encourage by asking op0en questions
- Encourage the use of different materials, i.e. flowers, twigs, sticks etc
- Be patient!(Swift and Umar, 1991)

After:
- Maker a copy of the map or model, including mapper's names
- Try drawing the same type of map with different groups of people. i.e. one group of women, a group of old men and the young
- Keep it simple
- Orient it appropriately
- Cross-check the map, compare with what you see
- Draw it in the area of study with the local people.

Semi structured interviews (SSI)
SSI is a guided interview here the major topics and a few key questions are formulated before the interview. But many new additional are asked during the interview based on answers to the key question.

Types of SSI:
1. The individual interview
- Get representative information about the society form individual informants
- Ask individuals at a time

2. The key informant interview
- Get specialized information from one or group of persons about the community
- Informants with specialized knowledge

3. Group interviews:
- Useful for obtaining general information about the community
- Better for cross checking information
- Group interviews require very careful preparation
- The ideal group is 8 – 15 people

_ **Types, sequencing, and chain interviews** -- Individual, pair, and group interviews are combined in a sequence to take advantage of key informants and specialist groups.

Using secondary sources
- Secondary sources of information include previously written documents maps, diagrams, tables etc
- Review secondary sources before beginning field survey is census data, aerial photos, marketing reports, etc.
- In reviewing secondary sources, you should keep summary notes, in the form of short paragraphs, diagrams, charts, etc
- In reviewing secondary sources, you should keep summary notes, in the form of short paragraph, diagrams, charts, etc.
- Be as critical as possible in reviewing secondary sources
- To develop understanding of local livelihoods
- Short period of time

Interview guides and checklist
- Formulate open – ended question and themes for free discussion
- Explore what farmers think about the theme
- Allow two way communication
- Learn as you go along rather than to answer specific questions of limited range
- Use the six helpers What? Why? How? Who? When? Where?
- Use simple questions with single idea
- Probe to explore more in depth, to stimulation
- Avoid ambiguous, leading, dead and direct questions scheduling and arrival
- Select open person to lead or control the interview
- Be sensitive to farming work or other work schedule
- Try not to disrupt working activities
- Agree on a team contract: what time to begin work cash morning? Who will take notes? (Write this in your notebook)

Beginning the Interview
- Will the team stand or sit on chairs with the informant sitting on the ground?
- Sit down in a suitable place & shade
- Begin with the traditional greeting in the local manner
- Explain who you are. Describe the purpose of your visit do not imply any promise
- If the informant is busy ask when it would be appropriate to return
- The team should say we are here to learn and mean it
- Spend some time in casual conversal

- Begin your questioning by referring to something or someone visible.
- Deal with more sensitive issues when confidence is built(Pottier, 1992).

Directing the flow of Interview
- Do not interrupt each other
- Write down new questions to ask latter on
- Ask one question at a time
- Take your time, allow your response to answer completely before moving on.
- Probe explore

Recording the interview
- Record during an interview
- Ask permission from your informants before you start writing things down or tape recording the discussion
- What to record

The interview setting
- Where was the interview held?
- Who was interviewed?
- Was it a group or individual?

Record what you see
- The condition of the farmers field
- Type of a house, possessions, access to water; indicators of wealth, health

Record what is said
- The details of an interview
- Do not attempt to analyze responses in your head and record an interpretation
- Record the conduct of the interview
- Assign an interview observer

Was it:
A Fact: Something definitely known to have occurred or be true
An opinion: judgment or belief base on grounds short of proof
A rumor: general talk, report of doubtful accuracy.
- Was the interview relaxed and open?
- Was it dominated by any individuals?
- Did the interviewer bias the response
- Judge the responses quickly
- Cross – check by comparing responses against other sources of information
- "Look wonder, questions"

Closing the interview
- Summarise the discussion briefly
- Look around the homestead or farm
- Ask respondents, if they have other issues to be looked in to
- Thank respondents graciously
- Take a few minutes with your colleagues to reflect on the interview and compare thoughts and impressions
- Make any additional notes you feel are necessary
- Fill in the blanks in your notebook while the interview is fresh in your mind
- Once done move on to the next household; or groups

_ **Permanent-group interviews** -- Established groups, farmers' groups, or people using the same water source can be interviewed together. This technique can help identify collective problems or solutions.

_ **Time lines** -- Major historical community events and changes are dated and listed. Understanding the cycles of change can help communities focus on future actions and information requirements.

Time related data analysis
Time Lines

A list of key events in the history of the community that helps identify post trends, events, problems, and achievements in its life.

Purpose
The time line helps the team to understand what local or national events the community considers to be important in its history. The time line is prepared through discussion wit a small groups or elders. The significant events in the history of the community hitherto kept in oral form are now documented.

What

The time lines go back as many generations as villagers can recall. Time line records could include, forest history, diseases, diets etc. These discussions provide a good opportunity to ask elders about previous trends and traditional responses, as well as about possible opportunities to resolve current problems.

Time lines are recorded by the community elders and any other long term resident. The team can only assist by asking proving questions. The composition of the community institutions, such as church groups, selfgroups, political units or the local administrations. Both women and men should be included(lnglis, 1990).

How
Group discussions are preferred to interviews of key individuals because they encourage dialogue among the community members and Addis, helping them remember events form the distant past. The elders

should be asked to identify that shaped and influenced individual and the community activity large sheets of paper and felt pens should be used to write in large letter in the local language. If there is difficulty in establishing dates for particular events, try to relate them to a renown event.

Application

This data re-in forces the community's perception of the evolving problems and the possible opportunities to be considered in the preparation of the CAP.

Trend Lines

Trend lines are helpful to understand the resident's perception of significant charges in the communities over time.

Purpose

Trend analysis will help the community to and PRA team to:

- Learn from the community how it views change over time in various sectors
- Integrate key changes into a village profile, which well simplify problem identification and
- Begin to organize the range of opportunities for the community to consider.

What

Information could be collected on trends over the past ten to forty years in the areas that support the community. A core set of trends should include changes in water availability, soil loss and fertility, deforestation and tree planting, grazing, employment rates food production and population.

Trend lines can be discussed with community representatives including elders, long term residents, leaders of church groups, women groups, and self help groups. If possible, all ecological zones in the study site should be represented.

How

The following steps are important for proper generation of trend lines.

1. PRA team should carefully explain the measuring of trend lines to the community groups.
2. Explain the concept of trend lines using simple graphs. Demonstrate the meaning of the two lines. Show them how time moves form left to right along the horizontal axis, and how the rate of increase/decrease in resource use is indicated on the upright vertical axis.
3. When the community members have understood the concept, ask one of them to draw the two lines on the ground. Once this is done, years should be indicated at equal intervals along the horizontal line.
4. Use the discussion of trends to probe for explanation of the changes. This will help identify underlying problems and traditional activities to correct the situation. Find out what solutions have been tried in the past and how well they have worked.

Application

Trend lines provide useful baseline information for researchers operating on micro level follow ups of such aspects as population, food availability, school enrollment etc. It forms the basis upon which problem identification and options assessment is made during the preparation of the community action plan

_ **Local histories** -- Local histories are similar to time lines but give a more detailed account of how things have changed or are changing. For example, histories can be developed for crops, population changes, community health trends and epidemics, education changes, road developments, and trees and forests.

_ **Local researchers and village analysts** -- With some training, local people can conduct the research process (for example, collect, analyze, use, and present data; conduct transects; interview other villagers; draw maps; make observations).

_ **Venn diagrams** -- To show the relationship between things, overlapping circles are used to represent people, villages, or institutions; lines are added to reflect inputs and outputs.

Ranking and scoring

Presentation:

A way in which various kinds of things can be compared according to different qualities people value. It places in an order of what is more or what is less important.

Purpose

Ranking methods allow us to see individual and group priorities among a number of alternative problems or solutions. It helps to generate reasons why people choose one item from the other.

What

People could use three different ways to generate a criteria for comparison and make up their choices.

(1) preference ranking
(2) pairewise ranking
(3) direct matrix ranking

(4) and direct matrix scoring

Preference ranking method helps to quickly get a good idea of what people think are the priority problem or preferences. The criteria attached to make up a choice is used to consider in the action plan. Individuals or groups vote on the items from most important to least important item. The choices could be between crop varieties, water points, food diets, livestock species, problems, solutions and many different issues, which require preferences. Paire wise ranking is used to compare between two items and make up a choice. It is more useful for exploring the reasons why people prefer one possibility over another. The moment a preference is made lots of criteria are explored to compare items using a group of criteria before a choice. Direct matrix ranking is used to list items to be compared along horizontal line and criteria on the vertical line to rank choices from most important to least important (i.e. 1st, 2nd, 3rd, 4th etc) In this case frequency of the items valued as the 1st choice helps to make up a final decision. Direct matrix scoring helps to attach a score to a comparable items against each criteria listed before a choice. A comparison could be made out of a score of 10(for instance) a comparison could be made between many items against one criteria set, and attach a score out of a maximum of 10 to items to be chosen. The frequencies of the highest scores (closer to 10) attached against many criteria helps to make up a decision for preference.

Who

Ranking and scoring could be done with individuals, households, community members deliberately selected and with mixed group of men, women, traditional leaders, local officials, extension workers etc. The group combination depends upon the issues to be ranked. Who should decision on the issues to be compared? Leads to the choice of informants.

How

The groups for discussion lists items to be compared. Let them generate either directly or thorough pair wise comparison criteria for ranking. Putting in an order of importance or ranking could be done through ranking order, scoring or key voting, from the most to least important. Thorough courting frequencies list in ranked order the items to be compared and make up a decision. The final choice could be made through group of criteria or a single but most important critieria. Some times, the period for ranking (emergency) or vested need to the item may influence decision-making procedures. While listing criteria, do not mix up. PRA teams criteria with those of the informants. Use positive criteria for comparison

Application

Community action plans are developed on the basis of peoples preferences. The problems, solutions technical inputs etc are arranged on the interests of the users(Appleyard, 1998).

Results:

As a result of the PRAs, the communities are expected to attain many benefits including:

• Expressing their own ideas and concerns;
• Organizing their knowledge about the past and present;
• Identifying as a community their problems, the causes of these problems and possible solutions;
• Developing a common plan to address these problems;
• Developing the ability to use their own resources more effectively and attract more resources from the outside.

The academicians/researchers involved in the PRAs are expected to get the following benefits:

• Developing better understanding of rural environments and social as well as economic dynamism taking place there;
• Appreciating the fact that communities are capable of analyzing their problems and outlining possible solutions to their problems;
• Participating in designing possible solutions to community problems;
• Utilizing the results of the PRA work as a research output for publications and presentations;
• Building their research and problem investigation capabilities;
• Supporting their classroom discussions to students with practical examples from the PRA findings.

The main objectives of the current PRA are:

1. empowerment of rural communities by assisting them to systematically utilize their local knowledge to identify problems and strengths, develop skills of analysis, and design appropriate mechanisms for intervention by themselves and/or by development agents;
2. advancement of understanding by academicians/researchers of local knowledge and acknowledgement of the capacity of communities to gather data, conduct analysis, and identify as well as prioritize problems and solutions;
3. utilization of the research questions/problems identified during the PRAs for further investigation;
4. documenting and presenting the outcomes of the PRAs to development agents (governmental and non-governmental) and other stakeholders so that they