

## The relationship between health beliefs and medication adherence in patients with type 2 diabetes: A correlation-cross sectional study

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**Abstract:** Medication adherence is effectively control of diabetes and result in decreasing high-expense care and complications of disease. Health beliefs of diabetic patients are one of effective factors on health behavioral which is strongly under influence of culture and atmosphere in which they grew up. Identifying the relationship between health beliefs and medication adherence in patients with type 2 diabetes. This cross sectional study was conducted on 150 patients with type 2 diabetes, referred to Karaj Diabetes Association during March-June 2011, selected by purposeful sampling. A three-part questionnaire including demographic data, testing medication adherence, and testing health beliefs of diabetic patients was used for data collection. The data were analyzed using description and analytic statistics including Pearson correlation coefficient, T test, and one way ANOVA. Significance level has been considered  $p < 0.05$ . In this study, most patients (46%) followed their medication regimen in average level. A significant positive relationship was found between medication adherence and subscales of Perceived severity ( $r=0.507$ ,  $p=0.000$ ), Perceived sensitivity ( $r=0.163$ ,  $p=0.050$ ), and a significant negative relationship was found between medication adherence and Perceived barriers ( $r=-0.871$ ,  $p=0.000$ ). No significant relationship was found between Perceived benefits and Recommended health – related activities with medication adherence ( $p=0.0672$ ). As to the findings, direct instruction to diabetic patients should be toward understanding severity of disease and complications due to lack of medication adherence, and they should be helped in order to face less problems for following their medication regimen.

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**Key words:** Health beliefs, medication adherence, type 2 Diabetes Mellitus.

### Introduction

Diabetics is the most common endocrine disease and is considered as one of the most common non-contagious disease across the world (1), which is increasingly growing and leads to server complications(2), as to world health organization (WHO) report, 150 million people suffered from diabetes mellitus in 2000 and it is estimated it exceed to 221 million in 2010 and 366 million in 2030 of which 10-15% is related to type I Diabetes and 85-

90% related to type II Diabetes(3), incidence of diabetes in Iran is around 6% of population i.e. more than 4 million (4). Diabetes brings several short-term and long term complications that they are irreversible in some cases(5), several studies have demonstrated the importance of medical interventions and teaching self-care in improving Glucose control and prevention of complications(6-8). Despite these interventions, incidence of complications is still high, one probable reason is lack of medication adherence

and self-care which requires long term multiple alteration in life style(9). As to studies medication adherence is effective on control of diabetes and results in lower referring to physician, need to drugs, times of hospitalization, high expenses of care and complications due to diabetes(10-12).

Although, there are body of evidence for effect of medication regimen on diabetes, following it is difficult for diabetic patients, even patients are disagree with these recommendations in some cases due to lack of knowledge(13, 14), e.g. Findings of public health interview in the US showed, just 60% of Diabetic patients adhered their regimen (15), studies of other countries also reported most patients do not follow the therapeutic recommendation(16, 17).

So detecting affecting factors on changing behaviors of diabetic patients is so important. Health beliefs of diabetic patients is considered as one of the influential factors on performing health behavior which help control of complications(18, 19).

Health beliefs model was introduced in 1960's in order to provide a framework for discovering why some people who are not ill, do preventive behaviors while some people fail in doing preventive actions (20). This model is a framework for simulating people for positive behaviors and avoiding negative health behaviors (21).

Many researchers apply this model for health intervention development the aim of behavior change (22). According to Health Beliefs Model, it is presumed that when a person follows recommended health related activities, it is under influence of Perceived sensitivity, Perceived severity of disease and Perceived benefits against Perceived barriers for following recommended behaviors. If Perceived barriers were less than Perceived sensitivity or Perceived severity of disease it is more probable to do recommended health related activities (23).

Perceived benefits is defined as how sticking to medication adherence is useful for their health. Perceived barriers means barriers for receiving medication regimen such as forgetfulness, family problems, lack of motivation and disorders in activity daily living. Perceived sensitivity is defined as people's beliefs about what would happen if they do not behave based on physician's orders, and Perceived severity is subjective understanding of severity of disease(24).

Studies have been performed on health beliefs and self-care behaviors: Savoca et al (2003) aimed to discover reasons of lack of glucose control in diabetic patient's results showed attitudes and experiences of patient are effective on control of disease (25). In

other study, relationship between health belief and doing preventive behaviors of diabetes in Chinese diabetic patients were studied and reported significant positive relationship between Perceived severity of disease and Perceived sensitivity with doing preventive behaviors of complication(9). while In Gutierrez et al (2011) study in Philadelphia, no significant relationship was found between Perceived sensitivity and Perceived severity with medication adherence(24). Brown et al (2007) studied Health beliefs of African-Caribbean people with type 2 diabetes in a qualitative study. According to the results knowledge and understanding of patients about diabetes was poor and they did not trust on the value of therapeutic recommendations in some cases. so According to the findings health beliefs of people was strongly under influence of culture and atmosphere they have raised up (26). Regarding the effect of health beliefs on medication adherence, controversial results in this term and effect of culture on health beliefs and so no Iranian study has been done on this topic. This study aimed to detect the relationship between health beliefs and medication adherence in patients with type 2 diabetes .

## **Methods**

### ***Sample and data collection procedure***

This correlation-cross sectional study conducted on 150 patient with type 2 diabetes, referred to Karaj Diabetes Associations during March-June 2011.

The sample size was determined using information obtained from a pilot study. By considering a confidence level of 95%, a power of 80%. a sample size of at least 120 cases was determined.

By anticipating the fall of the studied units ,Study was conducted on 150 patients selected by purposeful sampling. inclusion criteria were: completing informed consent, Iranian, educational level at least 5<sup>th</sup> elementary grade, age more than 18, history of type 2 diabetes at least for one year, medical file in Diabetes clinic, treatment with antidiabetic tablets with or without insulin therapy ,non- pregnant and mentally alert. Exclusion criteria was cognitive disorders which prevent completing questionnaires.

### ***Instruments and scoring procedure***

Data were collected using a three-part questionnaire. The first section was demographic data (11 items). The Second section included questionnaire of testing medication adherence in diabetic patients (Hernandez 1997) include 13 questions and contain 2 sub-scales of life style/ control and taking drug / treatment of complications (27), in this questionnaire the recommended policies of international federation of diabetes are studied, including sticking to healthy

diet, weight control, regular taking of drug, regular exercise, glucose monitoring and foot care. Its scale is visual simulation scored between 0-10, higher score yields higher adherence. validity of this questionnaire was confirmed by RezaeeKargar (2002) using content validity after its translation(28). Test-retest was used for confirming reliability, Pearson correlation coefficient was calculated 0.81 so time-related consistency was confirmed. Internal consistency was confirmed using Alpha-cronbach 0.88 for whole questionnaire and 0.82 for sub- scale of life style/control and 0.71 for sub - scale of taking drugs/treatment of interactivities.

The third section included questionnaire of testing health beliefs. It is categorized in 5 sub scales related to Perceived sensitivity (4 items), Perceived severity (4 items), Perceived benefits (7 items) Perceived barriers (9 items) and importance of recommend health- related activities (10 items). This questionnaire is integrated of multiple standard instruments (3, 20, 24), that was prepared after translating to Persian and matching to health belief model regarding Iranian culture. Each item was measured on a 5 point likert scale ranging from 0 "strongly disagree" to 4 "strongly agree" (3). Validity of instrument (with different items in each subscale) was confirmed in different studies (3, 20, 29).

in this study, experts opinions were used for confirming content validity of questionnaire. For reliability 10 patients completed questionnaire with a 2 week interval, then test-retest was applied and Pearson correlation coefficient was calculated and its time-related consistency was confirmed internal consistency was confirmed using Alpha cronbach (Table 1).

Permission letter was presented for data collection. Subjects were selected based on inclusion criteria after explaining goal of study, way of completing questionnaire and ensure patients of confidentiality of their information. One researcher was responsible for data collection because of presenting similar explanation to subjects.

#### **Data analysis**

Data were analyzed using descriptive and analytic statistics including Pearson correlation coefficient for relationship between health beliefs and medication adherence, T test and one way ANOVA for assessing difference of medication adherence mean and health beliefs mean by demographic data by SPSS 11.5 statistical software (SPSS Inc., Chicago, IL).

## **Results**

### **Demographic characteristics**

In this study of the 150 patients, most female (61.1%), housewife (49%), married (73,3%), with educational level less than high school diploma (58%), suffered from complications (59.2%) and familial history of diabetes (72.6%). The mean age of the subjects was 55.5 years(S.D.  $\pm$ 10.42).mean of duration of diabetes was 11.05 years(S.D.  $\pm$ 8.06). the majority of the patient(82%) had health insurance.

### **medication adherence**

The mean score of medication adherence was 81.44(S.D. $\pm$ 29.24), most of patients (46%) followed their medication regimen in average level, 41.3% in good level and 12.7% in poor level. The minimum mean score was related to exercises and most people were weak in this topic (Table 2).

### **Relationship between medication adherence with health beliefs**

significant positive relationship was found between medication adherence with subscales of Perceived severity ( $r=0.507$ ,  $p=0.000$ ), Perceived sensitivity ( $r=0.163$ ,  $p=0.050$ ), significant negative relationship was reported between medication adherence and Perceived barrier ( $r=-0.871$ ,  $p=0.000$ ) and no relationship was found between medication adherence and other subscales (Table 3).

### **health beliefs**

In this study, 125 patients (83.3%) Perceived that their disease is serious, 73 patients (48.7%) Perceived that they are susceptible to complications, while 77 patients (51.3%) believed that they would not get involved in complicaiothn. 111 patients (74%) believed sticking to medication regimen is useful for them, 81 people (54%) believed medication adherence is difficult for them and face many barriers including lack of knowledge related to proper diet, understanding importance of diet adherence, lack of motivation for regular follow-up of treatment due to time it consumes, expenses and lack of definite cure, in order to following their medication regimen.

### **relationship between medication adherence with demographic data**

In this study advancing age brought more medication adherence ( $r=0.40$   $p=0.000$ ) patients with more children showed less medication adherence ( $r=-0.42$   $p=0.000$ ).

significant difference was found between medication adherence by level of income ( $p=0.000$ ) according to post hoc test, significant different was shown between there groups , as mean of medication adherence in people with high level income was more than average income level and in the average income level was more than low income level ( $p=0.000$ ).

according to the findings, medication adherence in patients with educational level more than high school

diploma was more ( $p=0.000$ ) as well as patient who had not experience complication ( $p=0.008$ ) and in patient with health insurance ( $p=0.00$ ). No significant difference was found for medication adherence by other variables such as sex, diabetes duration, familial history of diabetes, types of insurance and type of treatment.

#### ***relationship between health belief and demographic data***

In this study, mean of Perceived sensitivity in patients with complication of diabetes, was significantly more ( $p=0.057$ ). Significant relationship was found between health beliefs and age and duration of diabetes (table 4). Except subscale of Perceived sensitivity, significant difference was found for other subscales of health beliefs by level of education (All  $p<0.05$ ) patient with higher level of education (high school diploma) had more positive health beliefs, but none of health beliefs subscales shows significant difference by familial history of diabetes, sex, level of income and type of treatment.

#### **Discussion**

In this study, most people had an average level of medication adherence and 12.7% were weak. Significant positive relationship was found between medication adherence and subscales of Perceived severity and Perceived sensitivity, significant negative relationship was found between medication adherence and Perceived barriers, as to the health beliefs model, probability of following health recommend under influence of Perceived sensitivity and Perceived severity as well as Perceived benefits against Perceived barriers. As patient who Perceived diabetes as a serious disease and believed in complicate and patients with lower barriers for conducting medication orders, acquired higher scores of medication adherence. Then health beliefs model is applicable in this community. In Gutierrez et al (2011) study conducted in Philadelphia on patients with diabetes and serious mental illness 23% had weak medication adherence they were patients who were anxious of drug side effects and Perceived more barriers. Patients who perceived more benefits showed more adherences. No significant relationship was found between Perceived sensitivity and Perceived severity of disease with medication adherence (24). In Tan (2004) study conducted on Chinese diabetic patients, 74% showed low therapeutic adherence, became just 21% believed that their disease is serious, 41% believed they are susceptible for complication, and significant positive relationship was found between Perceived severity and Perceived sensitive with complication prevention

behaviors, significant negative relationship was reports between Perceived barriers with prevention behavior of complications (9). In other study significant negative relationship was found between Perceived barriers and self care behavior and significant positive relationship was between perceived severity with glucose monitoring, no significant relationship was shown between other subscales of health beliefs and self care and glucose monitoring (23), results of the other studies showed health beliefs affect on doing health behaviors (30-32), but there is a controversy on relationship between subscales of health beliefs and medication adherence: in most studies, when patients are informed that lack of medication adherence result in severe consequences, they stick more to their regimen, however in Gutierrez et al (2011) it has no effect on the adherence (24), it seems it could be due to complicated nature of human behavior which is under influence of multiple factors such as age, sex, religion, race, job and level of education (33).

In this study although most patients Perceived that their disease is serious (83.3%), believed sticking to medication regimen useful for their health (74%) and understand the importance of health recommendations (92.7%). Just 41.3% of patients strongly adhered to their regimen. It seems it could be due to the followings:

Most people (51.3%) believed they do not involved in complications. In this study people who Perceived they come down to complications showed more adherence. Authors believe that in order to strengthening preventive behaviors, patient should be aware of behaviors and believe that it could maintain his health as well as believing in this fact that preventive behavior protect him against consequences of disease then probability of proper activities would be increased (34). Fear of complications or Perceived sensitivity cause measurement and control of blood glucose in diabetic patients and finally lead to more sticking to health recommendations (9, 35), Pinto suggested that the instructions of diabetic patients should focus on Perceived sensitivity as an important instrument of attracting patients (35). Brown et al (2007) study also showed instruction could improve health beliefs (36).

Sticking to medication regimen was difficult for 54% of subjects and perceived several barriers. In most study conducted in other countries, patients Perceived several barriers for controlling their disease (37), Chao (2005) wrote " A negative relationship is existed

between increasing Perceived barriers and medication adherence” (29). Tan (2004) stated Perceived barriers cause less adherence to recommended orders. He believed if Perceived barriers were less than Perceived sensitivity, it would be more probable that patients participate in recommended health activities (9). In Perceived barriers subscale, the maximum scores were related lack of knowledge related to proper diets, importance of diet adherence and lack of motivation for regular follow-up due to no definitive treatment for diabetic. These findings are in agreement with Tan (2004) on Chinese individuals with type 2 diabetes in Malaysia and Kartal (2007) conducted in turkey (3, 9).

In testing medication adherence, the minimum score was related to exercise, most people were weak in this topic it seems if would be due to culture of doing exercise in society.

In this study significant positive relationship was found between medication adherence and age while in Tan (2004) study, week negative relationship was found between age and complication prevention behaviors (9). Several studies also reported no relationship in this term (38, 39). On the whole, relationship between age and medication adherence in complex and are influenced by multiple factors of physical, psychological, and cognitive (39, 40).

Significant relationship was found between medication adherence and number of children, it has not studied in other studies, but number of children could result in lack of time and expense for adherence and subject, reported then as Perceived barriers.

In this study patients with higher level of education followed significantly their medication regimen, previous studies, also reported this findings (41-43). As to Tan (2004):" people with higher educational level Perceived their regimen much better and could come it over" (9).

As to the result, medication adherence score in higher income patients was higher it has not been studied in other papers. As expense is one of the Perceived barriers by patients, it could be affect on medication adherence.

Also in this study having health insurance resulted in significant increase of sticking to regimen, Keeler and etal said insurance and free care cause more

contact to health care system and acts as a reminder for regular taking drug (44).

As to the findings, patients suffered from complications showed more adherences to their medication regimen, mean of Perceived sensitivity was significant higher in these patients. Similar studies showed complications could increase medication adherence (45, 46).

Mean of Perceived benefits and recommended health related activities in patients with higher educational level was higher and perceived barriers mean was less,

it could lead to feel barriers ageist control of his disease (37).Tan (2004) showed Perceived severity and perceived sensitivity are increased with educational level (9), the other study showed there is a significant relationship between Perceived benefits, Perceived barriers and recommended health related activities with educational level(20).

#### **Limitations**

In this study patients were selected from patients referred to diabetes center by non randomize sampling, ethically just patient who would like to participate were selected this is an important limitation because they maybe more motivation for sticking to their medication regimen and the ratio of adherence overestimated.

#### **Conclusion**

As to the findings, people should believer in importance and benefits of health behaviors as well as perceived severity of disease and consequences due to lack of sticking to medication regimen. Broadcasting media could play important role .on the other hand Iranian diabetic patients like some other countries face different barriers such as lack of knowledge related to proper diet , understanding importance of sticking to diet,Lack of motivation for regular follow-up due to time in consumes expenses and no definite treatment for diabetic. So, providing health insurance, devoting more professional staff for this as well as improving educational programs could promote health beliefs. Sticking to medication adherence results in prevent of complications and quality of life development.

#### **Conflict of interest**

The authors declare that they have no conflict of interests.

**Tables:****Table 1**

Reliability for diabetes specific health beliefs model scale

Subscales	Number of items	Pearson coefficient	relationship	Cronbach alpha
Perceived susceptibility	4	0.814		0.82
Perceived severity	4	0.782		0.80
Perceived benefits	7	0.932		0.75
Perceived barriers	9	0.889		0.62
Recommended health – related activities	10	0.737		0.73

**Table 2**

Frequency and percentage of subjects according to the ranking scores of the medication adherence scale

Item	Weak		Moderate		strong		mean $\pm$ SD
	Frequency	percentage	Frequency	percentage	Frequency	percentage	
I follow of the meal plan exactly as my coach has suggested.	28	18.7	66	44.0	56	37.3	6.07 $\pm$ 2.98
I try to keep my weight in the range that my coach has recommended.	40	26.7	59	39.3	51	34.0	5.79 $\pm$ 3.25
I exercise the same number of times that my coach has prescribed for me.	61	40.7	51	34.0	38	25.3	4.73 $\pm$ 3.34
I only do sports and activities that my coach has recommended.	54	36.5	58	39.2	36	24.3	4.72 $\pm$ 3.34
I exercise at times that my coach has suggested.	62	41.3	51	34.0	37	24.7	4.74 $\pm$ 3.39
Every day I take the same number of pills or insulin that has been ordered by my physician.	16	10.7	37	24.7	97	64.7	7.75 $\pm$ 2.97
I take pills or insulin exactly at the time that my coach has suggested.	17	11.3	36	24.0	97	64.7	7.80 $\pm$ 2.94
I change the amount of tablets or insulin only if my coach tells me to do so.	20	13.5	33	22.3	95	64.2	7.67 $\pm$ 2.98
I test my blood sugar as many times that my coach has proposed.	22	14.7	51	34.0	77	51.3	7.02 $\pm$ 3.03
I test my own blood sugar at times that my coach has suggested.	23	15.3	46	30.7	81	54.0	7.11 $\pm$ 2.96
I treat my lowered blood sugar with a variety of drinks and candies that my coach has given.	39	26.0	50	33.3	61	40.7	5.95 $\pm$ 3.54
I only use the food and drinks that my coach has recommended when my blood sugar decreases.	45	30.0	46	30.7	59	39.3	5.77 $\pm$ 3.44
Every day I check my feet for wounds	27	18.0	36	24.0	87	58.0	7.21 $\pm$ 3.23

**Table 3**  
mean score and standard deviation of health beliefs subscales and its relationship with medication adherence

Subscales	mean $\pm$ SD	relationship with medication adherence
Perceived susceptibility	11.19 $\pm$ 4.14	r:0.163 p:0.050*
Perceived severity	13.70 $\pm$ 2.25	r:0.507 p:0.000*
Perceived benefits	23.30 $\pm$ 4.01	r:0.035 p:0.672
Perceived barriers	28.36 $\pm$ 6.70	r: -0.871 p:0.000*
Recommended health – related activities	37.24 $\pm$ 4.01	r:0.144 p:0.083

**Table 4**  
The relationship between age and duration of diabetes with health beliefs subscales

Subscales	age	Duration of diabetes
Perceived susceptibility	r:0.086 p:0.300	r:0.698 p:0.000*
Perceived severity	r:-0.163 p:0.047*	r:0.236 p:0.004*
Perceived benefits	r: -0.117 p:0.157	r:0.171 p:0.041*
Perceived barriers	r:0.382 p:0.012*	r:0.057 p:0.494
Recommended health – related activities	r:0.136 p:0.100	r:0.132 p:0.115

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