

Factors Related to Treatment Adherence in Type 2 Diabetic People Referring to the Tabriz Diabetes Clinic in 2015: Based on the Health Belief Model

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Abstract

Background: Treatment adherence is proposed as a challenge in diabetes care. The present study was performed aiming to determine the treatment adherence and factors related to it based on the health belief model

Methods: In a cross-sectional study type, 205 type 2 diabetic people who referred to Tabriz Diabetes Centers were selected by simple random sampling and entered the study. The data collection tool was a questionnaire including demographic characteristics, factors impacting on the treatment adherence based on the health belief model and treatment adherence behavior. Data was analyzed by SPSS software (version 16) by using statistical independent t-test and one way ANOVA at a significant level less than 0.05.

Results: The mean and standard deviation of the people under survey were 53.2±9.5 years and the duration to get diabetes was 6.6±4.5 years. They were about 66.8% women, 24.9% illiterate, and 9.3% had diploma and were academics. The mean of HbA1c was (7.4±1.3), and had about 39% poor treatment adherence. The treatment adherence had significant relationship with perceived severity (R=0.14), sensitivity (R=0.13), benefits (R=0.31), barriers (R=0.47) and HbA1c (R= -0.44). The health belief model structures of perceived benefits ($\beta=0.17$), barriers ($\beta=0.39$) and HbA1c ($\beta=0.21$) predicted about 29% of the treatment adherence variance.

Conclusions: Educational interventions based on the health belief model with emphasis on perceived benefits and barriers can be helpful for treatment adherence in people with diabetes.

Keywords: Type 2 Diabetes; Treatment Adherence; Fasting Blood Glucose; HbA1c; Health Belief Model; Self-Care

1. Introduction

According to the World Health Organization report, the number of people with diabetes increased from 108 million people in 1980 to 422 million people in 2014 and the global prevalence of diabetes among people over the age of 18 years has increased from 4.7 percent in 1980 to 8.5 percent in 2014 (1). The prevalence of diabetes worldwide is increasing rapidly, especially in low-income and middle-income countries (2, 3). The prevalence of diabetes in Iran,

according to the World Health Organization's 2014 report, is declared as 10% in men, 10.4% in women and 10.3% in total population (4). It is estimated that diabetes in Iran will increase from 8.4% in 2013 to 12.3 by 2035 (2).

Diabetes is one of the chronic diseases that affects the individual in terms of general health and social welfare in many ways and is very important worldwide in terms of treatment and disability (4). Diabetes creates a variety of complications such as blindness, kidney failure, heart attacks, stroke, and limb amputation (1). People with

diabetes need self-care behaviors to effectively control and prevent the progression of disease and its complications, and increasing self-care for diabetics is a challenge for the employees of health centers and organizations (5, 6). Considering the growing trend of diabetes, the establishment of care system, the prevention of diabetes and its complications are one of the key and important strategies, and the World Health Organization proposes easy and low-cost interventions including: blood glucose control in type 2 diabetic people through oral therapy and, if necessary, insulin, blood pressure control, foot care, and treatment adherence for developing countries (1).

Treatment adherence has been emphasized as one of the main ways of controlling diabetes (7). Based on the studies, medication treatment adherence in diabetics is not fully performed (8), and the investigation of Vousoghi et al. showed that 68% of people had poor self-care (9). Poor treatment adherence has been reported from 38% to 97% in various studies (3). Nowadays treatment adherence is proposed as a challenge and concern in diabetes care and interventions and training programs to improve self-care behaviors in treatment adherence (10). In this respect, in order to create a desirable and continuous behavior, the first step is to identify the factors affecting behavior in order to design and perform effective and low-cost interventions. One of the most suitable patterns for identifying factors related to behavior is Health Belief Model (HBM) that has been considered in the field of diabetes self-care behaviors and treatment adherence (11).

The Health Belief Model has five main structures that include: 1- Perceived sensitivity: A person's belief about the point that how much does he believe that a disease or specific condition will probably be created for him (the likelihood of getting infected by diabetes complications) 2- Perceived severity: A person's belief about the severity and seriousness of the disease complications or conditions such as death, disability and social consequences (occupation, everyday life, and social connections), 3- Perceived benefits: A person's belief about the benefits of recommended behavior in reducing the risk or the severity of disease (the benefits of taking diabetic medications) 4- Perceived barriers: A person's belief about the actual and psychological costs of the recommended behavior (medication complications, cost, and motivation), 5- External practice guideline (physician and family) and internal practice guideline (hunger, headache) (12).

Considering the importance of treatment adherence, the necessity of recognizing the predictor factors of treatment adherence and considering the limited studies in this field based on the health belief model, hence the aim of present study is the treatment adherence of type 2 diabetic people based on the health belief model.

2. Methods

The present research is a cross-sectional study and the investigated population is the type 2 diabetic people who referred to Tabriz Diabetes Clinic No. 9 and the time of research is 2015. The present research is a cross-sectional study and the investigated population is the type 2 diabetic people who referred to Tabriz Diabetes Clinic No. 9 and the time of research is 2015. Considering the prevalence of poor treatment adherence of 38% in the similar study ($P=.38$, $d=0.02$ and $z=1.96$), the sample size was obtained 230 people by using a statistical formula, which, after deleting the distorted questionnaires, ultimately 205 (response rate of 89.1%) questionnaires were analyzed.

$$N = \frac{(z - 1 - \alpha/2)^2 P(1-P)}{d^2}$$

From the list of diabetics referred to diabetes center number 9, the people under survey were selected by easy random method and entered the study. The criteria for entering the study included having diabetes records, lack of physical, cognitive and perceptual problems (ability to answer questions), having type 2 diabetes, diabetes diagnosis at least the past 6 months, consent and voluntarily participation to complete the questionnaire.

The data collection tool was a researcher-made questionnaire including demographic characteristics, treatment adherence and the variables of health belief model. Demographic characteristics included 7 questions (age, gender, history of diabetes, education, occupation, marital status, history of diabetes). Medication treatment adherence was measured by two questions of standard questionnaires related to diabetes self-care (13). "In the last seven days, how many days have you been taking prescribed diabetes medications?", and "How many days in the last seven days have you taken your medication s on time (based on physician's prescription)?" Each question was given zero (never) to seven (7 days) score.

The questionnaire related to the health belief model for treatment adherence was designed as researcher made by exploiting similar texts (14). This questionnaire consisted of perceived sensitivity (2 items), perceived severity (3 items), perceived benefits (4 items), and perceived barriers (5 items). The answer to the questions was in the five-option Likert's scale (I agree completely, I agree, I have no idea, I disagree, and I disagree completely) and the range of scores varied from 1 to 5, and each person could gain a score between 14 and 70 in total.

To investigate the content validity, the Content Validity Ratio (CVR), and Content Validity Index (CVI) were used. In order to determine the index and ratio of content validity, the questionnaire was provided to the Expert Panel including physicians (3 people) and health care staff (2 people) cooperating in a national diabetes prevention plan and health education specialists (5 people). According to the experts' view, the questions were reviewed and at this stage 2 questions were removed and 4 questions were modified. Content Validity Ratio (CVR) was obtained as 0.66; Content Validity Index (CVI) was obtained equal to 0.82. To determine the reliability, the questionnaire was completed within 2 weeks by 20 people under survey, that Cronbach's alpha was calculated for the whole questionnaire as (0.72), and the correlation coefficient as ($r=0.78$, $p < 0.001$). Cronbach's alpha for each of the variables was obtained as: perceived severity: 0.72, perceived benefits: 0.77, perceived sensitivity: 0.63 and perceived barriers: 0.72.

The questionnaires were completed by self-report method and with the help of trained questioners. The present research was approved by the Research Council and the Ethics Committee of Isfahan University of Medical Sciences with the code "292206". In order to ensure the observance of ethical standards, while expressing the goals of study, the informed consent and agreement were obtained for completing the questionnaire. People enrolled in to the study voluntarily and were free to accept or refuse cooperation in the research.

Data was analyzed by SPSS software (version18). The central indicators (mean, standard deviation, minimum and maximum score), dispersion and frequency tables were used to summarize the characteristics of sample under study. The statistical tests of independent t-test, one-way ANOVA and Pearson correlation test in terms of research variables were used to compare the mean score of treatment

adherence. Regarding the normality and independence of dependent variable and having a constant variance at the independent variables levels, linear regression was used to determine the predictor variables of treatment adherence.

3. Results

The people under survey included 137 women (66.8%) and 68 men (33.2%). The mean age of them was 53.21 ± 9.31 years and the duration of the disease was 6.54 ± 4.5 years. The results of present study showed that the treatment adherence in 80 people (39%) was poor and in 125 people (61%) was at desirable level and the mean score of treatment adherence was calculated as 11.19 ± 4.48 (Table 1).

Table 1: Characteristics of People under Study (Number=205)

Variable	Classification	Number	Percent
Gender	Female	137	66.8
	Male	68	33.2
Marital Status	Married	178	86.8
	Single	27	13.2
Education	Illiterate	51	24.9
	Elementary	56	27.3
	Middle School and High School	79	38.5
	Diploma and Higher	19	9.3
Treatment Adherence	Weak (Lower than Mean)	80	39
	Good (Higher than Mean)	125	61
HbA1c	Equal and Lower than 7.5	117	57.1
	7.6 to 8.9	54	26.3
	Equal to 9 and Higher	34	16.6
Variable	Mean (Standard Deviation)	Minimum	Maximum
Blood Glucose	169.3 (64.4)	63	418
HbA1c	7.4 (1.3)	5	11
Treatment Adherence	11.1 (4.6)	0	14
Age	53.2 (9.5)	32	75
Duration of Diabetes	6.6 (4.5)	1	24

About 21 people under survey (10.2%) did not take their medications in the last 7 days, and only 156 people (76%) had taken their medications according to the physician's prescription. The mean of fasting blood glucose level in the people under survey was 169.3 ± 0.64 , the HbA1c was

7.4±1.3 and the median of HbA1c was obtained 7.2. About 16.6% of the people under study had HbA1c above 9 (table 1). Medication treatment adherence had a significant relationship with perceived severity ($r=0.14$), perceived sensitivity ($r=0.13$), perceived benefits ($r=0.31$), perceived barriers ($r=0.47$) and HbA1c ($r=0.44$) (table 3). The most important perceived barriers for treatment adherence were medication forgetfulness 54% and fear of medication complications 24.9%, and 61% of the people under survey stated the most important perceived benefits of treatment adherence as preventing diabetes complications.

The mean (standard deviation) of HbA1c in people with poor treatment adherence ($sd=1.4$) was obtained 8.1 and in people with desirable treatment adherence ($sd=1$) was obtained 7, that this difference was statistically significant ($P < 0.001$). Based on the test of multiple linear regressions, the health belief model predicted 29% of the treatment adherence variance, that the perceived benefits and barriers had significant relationship with treatment adherence, and the perceived barriers were the most important factor impacting on treatment adherence (Table 4).

Table 2: Mean and Standard Deviation of Medication treatment Adherence in Terms of Case Study

Variable	Classification	Mean	Standard Deviation	P-value
Gender	Female	10.7	3.8	0.09
	Male	9.8	3.5	
Marital Status	Married	12.3	3.5	0.079
	Single	10.9	4.7	
Education	Illiterate	11	4.4	0.9
	Elementary	11.1	4.5	
	Middle School and High School	11.1	4.9	
	Diploma and Higher	11.6	4.5	
HbA1c	Equal and Lower than 7.5	12.7	3.1	<0.001
	7.6 to 8.9	11	4.5	
	Equal to 9 and Higher	7.5	5.3	

Table 3: Mean and Standard Deviation of Health Belief Model Structures and Pearson's Correlation Coefficient with Treatment Adherence in People under Survey

Variables	Treatment Adherence		Achievable Score Range	Mean (Standard Deviation)
	r	P-value		
Perceived Benefits	0.317	<0.001	4-20	17.6 (2.8)
Perceived Barriers	0.472	<0.001	5-25	16.5 (4.8)
Perceived Severity	0.141	0.043	3-15	10.5 (1.9)
Perceived Sensitivity	0.138	0.049	2-10	8.06 (1.8)

Table 4: Multivariate Linear Regression Model for Estimating Factors Impacting on Treatment Adherence in People with Type 2 Diabetes

Variables	Beta	t	P-value	Adjusted R2
Perceived Benefits	0.16	2.3	0.018	0.29
Perceived Barriers	0.31	4.3	0.001	
HbA1c	-0.21	-3.1	0.002	

4. Discussion

The present study was performed aiming to find out how the treatment adherence is in type 2 diabetic patients in 2015 based on the health belief model. According to the findings of present research, the health belief model variables had a significant relationship with treatment adherence, and among the variables, the perceived benefits and advantages of taking medication were stronger predictors for treatment adherence.

Based on the findings of present research, 39% of the people under survey had poor treatment adherence, in a way that about 10% had not taken medications at all in the last 7 days, which is consistent with previous researches in this area (15, 16). In the investigation Gholam Aliei et al. (2016) conducted with the aim of medication treatment adherence and factors related to it, they showed that 59.4% of patients have poor treatment adherence (16). The investigation of Lee et al. (2017) showed that one third of people with diabetes had taken medication only 4 days in the last 7 days (17). Considering that the main factor to control diabetes is medical recommendations and medication treatment, training the importance of taking medication and necessary interventions in this regard can help blood sugar control. At the time of referral of diabetic people, the question (feedback) about taking the medication at any time of referral can help the treatment adherence.

The present study showed that the health belief model predicted 29% of the variance of medication treatment adherence, which confirms the findings of previous studies (18, 19). But the present finding is contrary to the study of Karimi et al. (20) who had reported the predictability ratio of health belief model as 59.9%. The present difference could be due to the inequality of target group (women only), considering the whole self-care behavior of diabetes, and the combination of self-efficacy structure with health belief model (20). The health belief model refers to the individual's beliefs about the consequences and complications of a disease or health problem, as well as facilitators (benefits-action guide) and inhibitors (barriers) for conducting health-related behaviors. Therefore, in interventions related to treatment adherence and diabetes control, it should be considered by health service providers.

Based on the findings of present research, perceived barriers and perceived benefits had the highest correlation with treatment adherence, which confirms the researches of Karimi et al. (20), Vazini et al. (19), Ayele et al. (21),

Alatawi et al. (18). In the present investigation, the most important perceived barriers for treatment adherence are medication forgetfulness, lack of motivation, fear of medication complications, which is consistent with other researches in this regard (15, 22). "Forgetting" the medication has been reported from 16% to 55.1% in the previous studies (22, 23), which is consistent with the findings of present research. One of the barriers to treatment adherence in the present study was the fear of medication complications, which is consistent with previous studies. In the investigation of Mann et al. (24), treatment adherence had a significant relationship with the fear of medication complications and the fear of medication complications has also been reported in other studies (16, 22).

The present study showed that one of the barriers to take medication is the lack of motivation, which is consistent with other studies that mentioned factors such as tiredness of taking medication (56.7) and severity of treatment adherence (16, 24). The attitude of people with diabetes (positive or negative attitude) towards treatment adherence has a significant effect on diabetes control. The effect of beliefs and attitudes on treatment adherence of people with diabetes is more than socio-demographic and clinical factors (24). Therefore, strengthening beliefs and creating a positive attitude towards the benefits of taking medication should always be considered by physicians, nurses and health service providers.

According to the findings of present research, perceived severity and perceived sensitivity had a weak correlation with treatment adherence, which this relationship did not become significant in regression analysis along with other factors. The present results are consistent with the findings of the researches of Gutierrez et al. (14). But it is not consistent with some of the previous researches (18, 19).

In the present study, treatment adherence had significant relationship with HbA1c ratio, which is consistent with the results of the findings of previous studies in this area (16, 25). In the present research, the mean of HbA1c was 7.4% and its median was 7.2, indicating that 50% of the people under survey had HbA1c higher than 7.2, which is consistent with previous researches in this area (25), and in Mann's investigation (24), the mean of HbA1c was reported as 7.6, which is in line with the results of present research. About half of the people with diabetes have not been successful in controlling blood glucose, and the main cause

of failure to control blood glucose is attributed to inadequate treatment adherence (3) and is proposed as a challenge and concern for diabetes care (10).

The present research, based on the review of texts is one of the few studies that investigated the treatment adherence as a theoretically based, and the use of Health Belief Model exclusive questionnaire for adherence is the strength points of present research.

Investigating people referring to public Diabetes Control Centers is one of the limitations of present research. Individuals with diabetes who are at home or refer to private clinics have been ignored. The questionnaire was completed as self-report, which may have a recalling error and other errors related to the participant.

5. Conclusion

Based on the results of present research, treatment adherence is not fully performed and the health belief model is a proper predictor for treatment adherence. Interventions based on the present model framework can improve treatment adherence and blood sugar control in people with diabetes. Training in the area of the benefits of taking medication regularly, reducing barriers, and increasing the positive attitude toward treatment adherence should be considered in educational interventions by health service providers.

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References

1. World Health Organization. Diabetes. 2017. Available from: <http://www.who.int/mediacentre/factsheets/fs312/en/>. Accessed November 29, 2017.
2. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Res Clin Pract*. 2014 Feb;103(2):137-49.
3. Polonsky WH, Henry RR. Poor medication adherence in type 2 diabetes: recognizing the scope of the problem and its key contributors. *Patient Prefer Adherence*. 2016 Jul 22;10:1299-307.
4. Mazloomi Mahmoud Abad S, Hajizadeh A, Alaei M, Mirzaei M, Afkhami A, Fattahi M. [Preventive behaviors in people at risk for type 2 diabetes: the health belief model]. *Iranian Journal of Diabetes and Lipid Disorders*. 2012;11(6):544-50. [Persian]
5. Allison SE. Self-Care Requirements for Activity and Rest: An Orem Nursing Focus. *Nurs Sci Q*. 2007 Jan;20(1):68-76.
6. Nelson KM, McFarland L, Reiber G. Factors influencing disease self-management among veterans with diabetes and poor glycemic control. *J Gen Intern Med*. 2007 Apr; 22(4): 442-447.
7. American Diabetes Association. 1. Promoting Health and Reducing Disparities in Populations. *Diabetes Care*. 2017 Jan;40(Suppl 1):S6-S10.
8. Abebe SM, Berhane Y, Worku A. Barriers to diabetes medication adherence in North West Ethiopia. *Springerplus*. 2014;3:195.
9. Vosoghi Karkazloo N, Abootalebi Daryasari G, Farahani B, Mohammadnezhad E, Sajjadi A. The study of self-care agency in patients with diabetes (Ardabil). *Mod Care J*. 2012;8(4):197-204. [Persian]
10. Capoccia K, Odegard PS, Letassy N. Medication adherence with diabetes medication: a systematic review of the literature. *Diabetes Educ*. 2016 Feb;42(1):34-71.
11. Yue Z, Li C, Weilin Q, Bin W. Application of the health belief model to improve the understanding of antihypertensive medication adherence among Chinese patients. *Patient Educ Couns*. 2015 May;98(5):669-73.
12. Glanz K, Rimer BK, Viswanath K (eds.). *Health behavior and health education: theory, research, and practice*. 4th ed. San Francisco: John Wiley & Sons; 2008.
13. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care*. 2000 Jul;23(7):943-50.
14. Gutierrez J, Long JA. Reliability and validity of diabetes specific Health Beliefs Model scales in patients with diabetes and serious mental illness. *Diabetes Res Clin Pract*. 2011 Jun;92(3):342-7.
15. Jackson IL, Adibe MO, Okonta MJ, Ukwue CV. Medication adherence in type 2 diabetes patients in Nigeria. *Diabetes Technol Ther*. 2015 Jun;17(6):398-404.
16. Gholamaliei B, Karimi-Shahanjarini A, Roshanaei G, Rezapour-Shahkolaei F. Medication Adherence and its Related Factors in Patients with Type II Diabetes. *Journal of Education and Community Health*. 2016;2(4):3-12. [Persian]
17. Lee CS, Tan JH, Sankari U, Koh YL, Tan NC. Assessing oral medication adherence among patients with type 2 diabetes mellitus treated with polytherapy in a developed Asian community: a cross-sectional study. *BMJ open*. 2017 Sep 1;7(9):e016317.
18. Alatawi YM, Kavookjian J, Ekong G, Alrayees MM. The association between health beliefs and medication adherence

- among patients with type 2 diabetes. *Res Social Adm Pharm.* 2016 Nov - Dec;12(6):914-925.
19. Vazini H, Barati M. The Health Belief Model and self-care behaviors among Type 2 diabetic patients. *Iranian Journal of Diabetes and Obesity(IJDO).* 2014;6(3):107-13.
20. Karimy M, Araban M, Zareban I, Taher M, Abedi A. Determinants of adherence to self-care behavior among women with type 2 diabetes: an explanation based on health belief model. *Med J Islam Repub Iran.* 2016; 30: 368.
21. Ayele K, Tesfa B, Abebe L, Tilahun T, Girma E. Self care behavior among patients with diabetes in Harari, Eastern Ethiopia: the health belief model perspective. *PLoS One.* 2012 Apr 17;7(4):e35515
22. Tang F, Zhu G, Jiao Z, Ma C, Wang B. Self-reported adherence in patients with epilepsy who missed their medications and reasons for nonadherence in China. *Epilepsy Behav.* 2013 Apr;27(1):85-9.
23. Adegbola SA, Marincowitz GJ, Govender I, Ogunbanjo GA. Assessment of self-reported adherence among patients with type 2 diabetes in Matlala District Hospital, Limpopo Province. *Afr J Prim Health Care Fam Med.* 2016 Jul 28;8(1):e1-5.
24. Mann DM, Ponieman D, Leventhal H, Halm EA. Predictors of adherence to diabetes medications: the role of disease and medication beliefs. *J Behav Med.* 2009 Jun;32(3):278-84.
25. Elsous A, Radwan M, Al-Sharif H, Abu Mustafa A. Medications adherence and associated factors among patients with type 2 diabetes mellitus in the Gaza Strip, Palestine. *Front Endocrinol (Lausanne).* 2017 Jun 9;8:100.