Medication Adherence and Associated Factors Among Type 2 Diabetic Patients in East Azerbaijan, Iran

Doğu Azerbaycan'da Tip 2 Diyabet Hastaları Arasında Tedavi Uyuncu ve İlişkili Faktörler

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Abstract

Objective: The aim of this study was to determine the factors contributing to non-adherence to medication and non-medication treatments among diabetic patients.

Material and Methods: This cross-sectional study was conducted in family medicine clinics in Tabriz, Northwest of Iran, from May-September of 2018. The Persian version of the eight-item Morisky Medication Adherence Scale was used to assess the adherence to treatment, and a validated questionnaire was used to determine the factors influencing non-adherence to treatment. We analyzed the data using descriptive statistics, t-test, chi-square test, and logistic regression modeling.

Results: A total of 320 diabetic patients were included in this study with a mean age of 58.1±13.7 years, with 36.2% males and 63.8% females. Of the patients, 0.9%, 14%, and 85% of patients had high, moderate, and low adherence to medication, respectively. In univariate logistic regression, the factors that associated with high adherence to treatment were female gender, living alone, living in urban, lacking insurance, and having diabetic complications. In contrast, in multivariate logistic regression, only two factors associated with high adherence to treatment, namely, living alone (odds ratio, 3.29; 95% confidence interval: 1.44–7.94) and unemployment odds ratio, 0.085; 95% confidence interval: 0.008–0.9).

Conclusion: Adherence to treatment in our study population was suboptimal. Our study population specified the lack of places for physical activity and difficulty in maintaining diet as major barriers for adherence to treatment. We also identified occupation and living arrangement to be predictive factors for adherence to treatment.

Keywords: Treatment adherence; diabetes mellitus, type 2; morisky medication adherence scale

Özet

Amaç: Bu çalışmada, diyabetik hastalar arasında ilaç tedavisine ve ilaç dışı tedavilere uyuncun olmamasına katkı sağlayan faktörlerin incelemesi amaçlanmıştır.

Gereç ve Yöntemler: Bu çapraz tasarımlı çalışma, İran'ın Kuzey Batısında Tabriz'de, aile hekimliği kliniklerinde, Mayıs-Eylül 2018 tarihleri arasında yürütülmüştür. Tedaviye uyuncu değerlendirmek için, sekiz-başlıklı Morisky İlaç Tedavisine Uyunç Ölçeği'nin İran versiyonu ve tedaviye uyuncun olmamasına katkıda bulunan faktörleri saptamak için onaylı bir soru formu kullanılmıştır. Veriler; tanımlayıcı istatistikler, t-testi, ki-kare testi ve lojistik regresyon modelleme kullanılarak analiz edilmiştir.

Bulgular: Çalışmaya toplam 320 diyabetik hasta dâhil edilmiştir. Hastaların ortalama yaşları 58,1±13,7 yıldır, %36,2'si erkek ve %63,8'i kadındır. Hastaların %0,9'u, %14'ü ve %85'i tedaviye sırası ile yüksek, orta derecede ve düşük uyunç göstermiştir. Tek değişkenli lojistik regresyonda, tedaviye yüksek uyunç ile ilişkilendirilen faktörler şunlardır: Kadın cinsiyet, yalnız yaşamak, şehirde yaşamak, sigortanın olmaması ve diyabetik komplikasyonların varlığı. Aksine, çok değişkenli lojistik regresyonda yüksek uyunç ile ilişkili sadece iki faktör belirlenmiştir. Bunlar; tek başına yaşamak (odds oranı, 3,29; %95 güven aralığı: 1,44–7,94) ve işsiz olmaktır (odds oranı, 0,085; %95 güven aralığı: 0,008–0,9).

Sonuç: Çalışma populasyonumuzda tedavi uyuncu suboptimaldir. Çalışma populasyonumuz, tedavi uyuncuna en büyük engel olarak fiziksel aktivite için uygun yerlerin olmamasını ve diyeti sürdürmenin güçlüğünü belirtmiştir. Çalışmamızda, aynı zamanda, meslek ve yaşam düzenlemeleri de tedavi uyuncu için prediktif faktörler olarak saptanmıştır.

Anahtar kelimeler: Tedavi uyuncu; diabetes mellitus, tip 2; morisky ilaç tedavisine uyunç ölçeği

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Introduction

Diabetes mellitus is a heterogeneous group of metabolic disorders with specific genetic, etiologic, immunologic, and pathophysiologic mechanisms characterized by glucose intolerance and hyperglycemia (1,2). It is the leading cause of death and disability worldwide, and its global prevalence is estimated to rise to 10% by 2030 (3). In 2011, approximately 4.5 million Iranian adults were living with diabetes; by 2030, this number is estimated to increase to 9.2 million people (4). Various definitions for adequate adherence have been proposed. In general, it is defined as at least 80% use of prescribed drugs and other therapies in terms of dosage, frequency, and duration of treatment (5,6). Several factors impede adherence to treatment among diabetic patients, including, but not limited to, need to take more than one drug or multiple doses daily, high cost of treatment, fear of adverse effects, comorbidities, depression, forgetfulness, lack of medication knowledge, health beliefs, and psychological problems (7-10). Studies suggest that less than 50% of diabetic patients achieve glycemic goals recommended by the American Diabetes Association (ADA) (11). Low adherence to treatment is associated with higher risks of both, micro-vascular (lower limb amputation, blindness, kidney failure) and macro vascular (heart failure, heart attacks, and stroke) complications (12). Non-adherence to anti-diabetic medications is one of the most serious problems faced by many health care system; similarly, non-adherence to dietary recommendations is also prevalent among diabetic patients (13). The identified barriers to treatment-adherence may differ from one population to another due to environmental, socio-economic, and cultural differences across countries (8). This study aims to assess the adherence by diabetic patients to pharmacological and non-pharmacological recommendations and to identify its association with factors related to the patient, patient-provider relationship, therapeutic regimen, and the disease itself.

Material and Methods

This cross-sectional study was conducted between May and October 2018, in Tabriz, Iran. A total of 320 type 2 diabetic patients, who attended to Asad Abadi family medicine clinic and diabetic clinics, were studied. (considering the 50% medication adherence rate, α=0.05, ß=80%) (14). The patients with type 2 diabetes, above 30 years of age, and on anti-diabetic medications were included. The patients who had any type of cognitive or mental disorders were excluded from the study, as they would interfere with responsiveness and be discontent to participate. All patients were interviewed and adherence was measured using the Persian version of eight-item Morisky Medication Adherence Scale (MMAS-8). They were surveyed with regards to socio-demographic data, medication, and disease as well as about psychosocial barriers to medication adherence. For illiterate patients, the researchers helped them to fill the questionnaires.

Statistical analysis

Descriptive statistics were used to describe the socio-demographic and other information of the patients and the rate of their adherence to treatment. Mean and standard deviation (SD) were used for continuous variables; whereas, frequency and percentage were used for categorical variables. Student's t-test and Chi-Square test were used to compare the mean age and qualitative variables between male and female. Univariate and multivariate logistic regression tests were used to assess the relationship between independent variables and scores for adherence to treatment. Continuous data of scores for adherence to treatment were converted to high adherence to treatment (score=8), moderate adherence to treatment (score 6 to 8), and low adherence to treatment (score of <6). There were only three patients with high adherence to treatment. Hence, to examine the relationship between MMAS scores and independent variables, subjects with high and moderate adherence to treatment were merged into the same group. Finally, ordinal data were converted to nominal data and dichotomized to adherence to treatment (score ≥6) and non-adherence to treatment (score <6).

Results

A total of 320 diabetic patients, aged 30 years and older, were included in our study. Table 1 presents the socio-demographic characteris-

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Table 1. Socio-demographic characteristics of the study population (n=320).

Characteristics	Total number	Frequency	Male	Female
Gender				
Male	116	36.2%		
Female	204	63.8%		
Age				
≤50 years	103	32.2%	41	62
>50 years	217	67.8%	75	142
Marital status				
Single	7	2.2%	3	4
Married/divorced/widowed	313	97.8%	113	200
Living arrangement				
Alone	44	13.8%	8	36
With family	276	82.2%	108	168
Family history of diabetes				
Yes	195	61%	65	129
No	125	39%	50	75
Occupation				
Unemployed	19	9.7%	8	11
Housewife/husband	176	30%	2	174
Manual worker	26	32%	22	4
Self-employed	65	20%	62	3
Employee	34	8.3%	22	12
Education				
Illiterate	114	35.6%	21	93
Under the diploma	134	41.9%	49	85
Diploma and higher	72	22.5%	46	26
Number of children				
<4	170	76.6%	84	161
≥4	150	23.4%	32	43
Number of households				
<4	245	76.6%	84	161
≥4	75	23.4%	32	43
Living area				
Urban	230	72%	90	140
Rural	90	28%	26	64
Home Ownership				
Yes	258	%80.6	88	170
No	62	%19.4	28	34
Insurance				
Yes	235	73.4%	79	156
No	85	26.6%	37	48
Income				
Less than one million Toman¥	204	63.8%	69	135
More than one million Toman	116	36.2%	47	69
Spouse occupation				
Unemployed	31	9.7%	4	27
Housewife/husband	96	30%	90	6
Manual worker	102	32%	10	92
Self-employed	64	30%	4	60
Employee	27	8.3%	8	19
Spouse education				
Illiterate	106	33%	37	69
Under the diploma	159	50%	52	107
Diploma and higher	55	17%	27	28

¥ Toman: Iran's currency.

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tics of all the participants. The majority of the patients, 63.8%, were female. The mean age of the study population was 58.1±13.7 years, the oldest being 85 years. Approximately 74% of the patients had health insurance, and 64% of them had a low salary, less than one million Iranian Tomans (Table 1). About 90% of the patients were on oral hypo-glycemic medications like Biguanide and sul-fonylureas, 5% on insulin, and 20% on both, oral hypoglycemic medication and insulin. According to the MMAS-8 scores, 0.9%, 14%, and 85% of our study population had high, moderate, and low adherence to treat-ment, respectively (Figure 1).

Three patients had high adherence to treat-ment, with two males and one female. Forty-five patients had moderate adherence to treatment, 36 females and 9 males. Ma-jority of the patients, 272 in total, had low adherence to treatment, with 167 females and 105 males (Figure 2). The rates of high, moderate, and low adherence to treatment among females were 0.5%, 17.6%, and 81.9%, respectively. Similarly, the rates of high, moderate, and low adherence to treat-ment among males were 1.7%, 7.8%, and 90.5%, respectively. Approximately 65% of the participants claimed that they forget to take their medicines (Table 2).

Table 2 lists the reasons for moderate and low adherence to treatment among diabetic patients, grouped by gender. Diabetic pa-
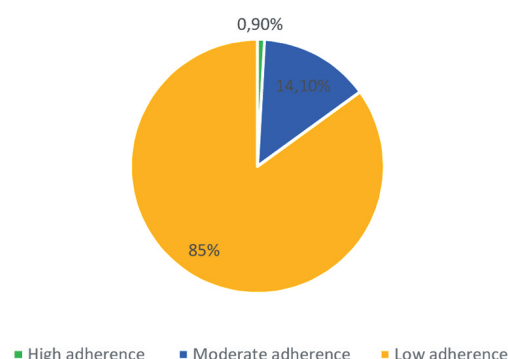
The frequency of medication adherence

Figure 1: The rate of medication adherence according to the score on Morisky 8-Item Medication Adherence Questionnaire (MMSE score= 8: High adherence; MMSE score= 6-8: Moderate adherence; MMSE score <6: Low adherence).

tients with moderate adherence stated that lack of suitable place (53%) and time (44%) for physical activity as well as difficulty in monitoring blood sugar at home (40%) were the main reasons for the non-adherence to prescribed therapies. Diabetic patients with low adherence expressed that lack of suit-able place (59%) and time (55%) for phys-ical activity, difficulty in maintaining recommended diet (50%), and limited ac-cess to their physicians (39%) were the main reasons for the non-adherence to their treatments (Table 3).
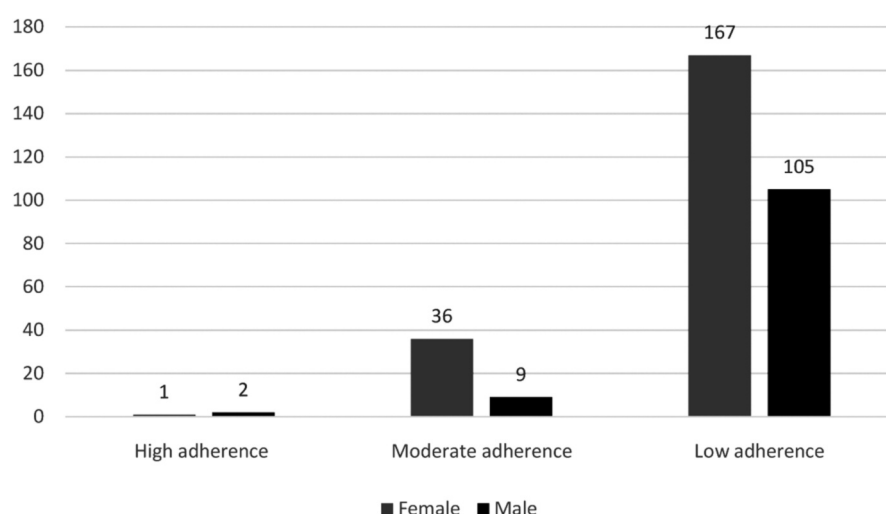

Figure 2: Comparison of the Morisky Medication Adherence Scale score (MMSE score= 8: High adherence; MMSE score= 6-8: Moderate adherence; MMSE score <6: Low adherence) between male and female.
* Chi-square test was used.

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Table 2. The responses of the study population to the eight-item Morisky Medication Adherence Scale (n=320).

Number	Questions	Total No. (%) Yes	No
Q1	Do you sometimes forget to take your medicine?	211 (65%)	109 (34%)
Q2	People are sometimes mistaking their medicines for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine	214 (66.8%)	106 (33.2%
Q3	Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?	224 (70%)	96 (30%)
Q4	When you travel or leave home, do you sometimes forget to carry your medicine?	235 (73.4%)	85 (26.6%)
Q5	Did you take all your medicines yesterday?	259 (81%)	61 (19%)
Q6	When you feel like your symptoms are under control, do you sometimes stop taking your medicine?	177 (55.3%)	143 (44.7%)
Q7	Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	303 (94.7%)	17 (5.3%)
Q8	How often do you have difficulty remembering to take all your medicine?		
	- A. Never/rarely	58 (18.1%)	
	- B. Once in a while	132 (41.2%)	
	- C. Sometimes	83 (25.9%)	
	- D. Usually	30 (9.4%)	
	- E. All the time	17 (5.3%)	

According to the univariate regression analysis, the relationship between MMAS score and variables such as gender, living arrangement, housing status, place of residence, insurance status, and diabetes complication was statistically significant (P<0.05) (Table 4). However, in the multivariate analysis, only two variables, living arrangement, and occupation, had a significant relationship with the score of adherence to treatment (Table 5).

Discussion

Earlier studies have indicated that more than 50% of patients with chronic diseases in developed countries are non-adherent to their prescribed treatments. In developing countries, these rates are even lower (11,15). In our study, 85% of the patients had low adherence to their prescribed medication, as measured by the eight-item Morisky medication adherence scale. The rate of high and moderate adherence was 0.9% and 14%, respectively. Our reported adherence was suboptimal and lower than previous findings, reported from Gaza Strip (58% high adherence) (16), south India (54% non-adherence) (17), and Iran (49.7% low adherence to traditional medicine) (18). However, Sontakke et al. re-

ported results similar to ours, and the high, moderate, and low adherence to treatments for type 2 diabetes among their participants was 0%, 26%, and 74%, respectively (10). The widely varying rates of medication adherence could be attributed to factors related to the study settings, socio-economic status, and metrics used for adherence assessment (14,16,19).

Diabetic patients in our study reported several factors that hindered adherence to non-medication recommendations for control of their disease. The major barriers were lack of suitable places and time for physical activity and difficulty in maintaining the recommended diet. In our study population, financial problems for providing anti-diabetic medications were higher in females than in males. However, it was not reported as a major barrier to medication adherence in both genders. This could be due to the fact that the majority of the anti-diabetic medications in Iran are produced within the country, and medicine prices are highly regulated by the Pricing Committee and Food and Drug Organization. Therefore, the anti-diabetic medications are easily affordable (20).

Medication adherence to treatments could be affected by numerous factors, such as medication and disease, socio-demograph-

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Table 3. Reasons for low and moderate adherence to medication and non-medication treatments among type 2 diabetic patients grouped by gender (n=320).

Questions	Group with medium adherence (n=45)			Group with low adherence (n=272)		
	Male (n=9)	Female (n=36)	Total	Male (n=105)	Female (n=167)	Total
I do not have enough money to buy medication	2 (22.2%)	14 (39%)	16 (35.5%)	22 (21%)	61 (36.5%)	83 (30.5%)
Access to medication is difficult to me.	2 (22.2%)	11 (30.6%)	13 (29%)	14 (13.3%)	41 (24.6%)	55 (20.2%)
My family does not support me in the treatment process.	3 (33.3%)	6 (16.7%)	9 (20%)	28 (26.7%)	27 (16.7%)	55 (20.3%)
I cannot easily access to my physician whenever I need.	5 (62.5%)	11 (30.6%)	16 (35.5%)	30 (28.8%)	77 (46%)	107 (39.3%)
My physician does not treat me well and does not answer to my questions about the disease	0	7 (19.4%)	7 (15.5%)	21 (20%)	54 (32.3%)	75 (27.6%)
Keeping a diet is difficult for me.	1 (11.1%)	9 (25%)	10 (22.2%)	54 (51.4%)	83 (49.7%)	137 (50.4%)
I am embarrassed by dieting in the presence of others.	0	5 (13.9%)	5 (11%)	12 (11.4%)	33 (19.8%)	45 (16.5%)
I do not have enough time to do sports and physical activity.	3 (33.3%)	17 (47.2%)	20 (44.4%)	60 (57%)	91 (54.5%)	151 (55.5%)
I do not have access to a convenient place for exercise and physical activity	4 (44.4%)	20 (55.6%)	24 (53.3%)	63 (60%)	97 (58%)	160 (58.8%)
It is difficult for me to check blood sugar at home	6 (66.7%)	12 (33.3%)	18 (40%)	48 (45.8%)	86 (51.5%)	134 (49.3%)
I am not aware of the diabetes complications	2 (22.2%)	6 (16.7%)	8 (17.8%)	18 (17%)	47 (28%)	65 (24%)
Medication and its importance are not clear to me.	0	0	0	4 (3.8%)	3 (1.8%)	7 (2.6%)
I am not aware of the effects of not taking medication.	0	0	0	6 (5.7%)	4 (2.4%)	10 (3.7%)
Medications have little effect on disease control.	0	8 (22.8%)	8 (17.8%)	7 (6.7%)	13 (7.8%)	20 (7.4%)
Observance with non-pharmacological recommendations, such as exercise and diet, is not effective in disease control.	2 (22.2%)	6 (16.7%)	8 (17.8%)	13 (12.4%)	33 (19.8%)	46 (16.9%)

ics, psychosocial needs, and healthcare availability (15,17). In our study, females were more likely to be adherent to their therapies than males, which is consistent with the previously reported study by Elsous, et al. in Gaza (16). Contrary to other studies, the older patients in our study were poorer adherent to treatment than younger patients, but it was not statistically significant (19,21,22). In this case, our result is consistent with the study by Donnan et al. (13). We observed that the rate of adherence was better in patients living in rural areas than the urban residents. This may be related to the presence of family physician program in rural areas, strong patient-physician relationships as well as rural insurance coverage. Medicine-related factors have an important impact on adherence to treatments among patients of chronic diseases. In general, an increase in the number of doses per day or polypharmacy leads to a decrease in adherence to treatment (15,23). In our study, diabetic patients, receiving more than three anti-hyperglycemic medicines daily, were poorer adherent to their therapies.

Using Univariate logistic regression, we observed that factors such as gender, living arrangement, living area, insurance, and diabetic complications were displayed significant association with adherence to treatment. In contrast, in multivariate logistic regression, only two factors, living arrangement, and occupation, were significantly associated with adherence to treatment. In another study from Iran, several factors were identified as predictive factors for medication adherence. These included age, education, patient care, and treatment expenditure, healthcare system, medication and diseases, patients' beliefs about illness, self-efficacy, and concerns about side

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Table 4. Relationship between demographics, socioeconomic status, disease and drug identifiers with treatment adherence score using logistic regression (unadjusted).

Variable	Number	OR	(95% CI)	P-value
Sex				
Female	204	2.11	1.03-4.32	0.040
Male	116	Reference	Reference	
Age				
>50 years	217	0.61	0.32-1.15	0.13
≤50 years	103	Reference	Reference	
Marital status				
Married	313	1.06	0.12-9.009	0.95
Single	7		Reference	
Living arrangement				
Alone	44	2.88	1.38-6.04	0.005
With family	276	Reference	Reference	
Number of children				
≥4	150	0.63	0.33-1.19	0.16
<4	170	Reference	Reference	
Education				
Illiterate	114	0.86	0.36-2.07	0.75
Under the diploma	134	1.35	0.6-3.04	0.46
Diploma and higher	72	Reference	Reference	
Occupation				
Unemployed and Manual worker	45	0.13	0.015-1.18	0.071
Housewife/husband	176	1.38	0.5-3.8	0.52
Self-employed	65	0.81	0.81-2.7	0.73
Employee	34	Reference	Reference	
Spouse occupation				
Unemployed and Manual worker	133	1.85	0.51-6.6	0.34
Housewife/husband	96	0.82	0.20-3.2	0.78
Self-employed	64	1.6	0.42-6.4	0.46
Employee	27	Reference	Reference	
Spouse education				
Illiterate	106	0.90	0.37-2.2	0.94
Under the diploma	159	0.86	0.37-2	
Diploma and higher	55	Reference	Reference	
Number of family members				
≥4	75	0.72	0.33-1.56	0.40
<4	245	Reference	Reference	
Housing status				
Personal	62	0.43	0.16-1.15	0.096
leasing	258	Reference	Reference	
Living location				
Urban	230	0.48	0.25-0.91	0.026
Rural	90	Reference	Reference	
Insurance				
No	85	0.34	0.14-0.85	0.021
Yes	235	Reference	Reference	

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Table 4. Relationship between demographics, socioeconomic status, disease and drug identifiers with treatment adherence score using logistic regression (unadjusted) *(continued)*.

Variable	Number	OR	(95% CI)	P-value
Income				
Less than one million Toman¥	204	1.64	0.83-3.2	0.15
More than one million Toman	116	Reference	Reference	
Duration of diabetic disease				
>10 years	87	0.87	0.43-1.77	
≤ten years	233	Reference	Reference	0.71
Comorbidity				
Yes	215	0.7	0.37-1.32	0.28
No	105	Reference	Reference	
Diabetic complications				
Yes	131	0.48	0.24-0.95	0.037
No	189	Reference	Reference	
Family history of diabetes				
Yes	195	0.79	0.42-1.48	0.47
No	125	Reference	Reference	
Number of antidiuretic drugs				
≥ 3	127	0.80	0.42-1.53	0.51
<3	193	Reference	Reference	
Types of glucose-lowering drugs				
Tablet	288	Reference	Reference	
Insulin	16	0.00	0.00	0.99
Tablet and Insulin	66	0.46	0.18-1.15	0.098
Frequency of doses				
>2	135	1.31	0.71-2.4	0.38
≤2	185	Reference	Reference	
Price of drugs				
>50000 Toman¥	117	0.60	0.30-1.18	0.14
≤50000 Toman	203	Reference	Reference	

¥ Toman: Iran's currency.

effects of drugs (24). The predictive factors for medication adherence vary from country to country. In the study by Al-Haj Mohd et al. in the United Arab Emirates, the factors such as level of education, age, duration of diabetes, insulin use, ethnicity, and certain cultural behaviors were identified as predictive factors to medication adherence among their diabetes (21). Indeed, many variables influence medication adherence by the patients, such as socioeconomic determinants, cultural factors, health system, and patients' health beliefs to name a few.

Conclusion

This study revealed that adherence to anti-diabetic medication was suboptimal among the patients in Tabriz, East Azerbaijan province of Iran. Occupation and living arrangement were identified as predictive factors for adherence to treatment in our study population. A majority of our diabetes patients also forget to take their prescribed medicine on time or even at all. We observed that the frequent barriers for adherence to treatment were the lack of suitable places for physical activity and difficulty in keeping the diet. Our results may help health policymakers in designing interventions and programs that can improve self-management in diabetes patients and increase the rate of adherence to recommended medications.

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Table 5. Relationship between treatment adherence score and study variables among diabetes (n= 320) (Univariate and multivariate logistic regression analysis)

Variable	Univariate analysis		Multivariate analysis	
	(95%CI) EXP	P-value	(95%CI) EXP (B)	P-value
Sex				
Female	2.11 (1.03-4.23)	0.040	1.31 (0.28-6.03)	0.72
Male	Reference		Reference	
Living arrangement				
Alone	2.88 (1.38-6.04)	0.005	3.29 (1.44- 7.49)	0.005
With family	Reference		Reference	
Occupation				
Unemployed and Manual worker	0.13 (0.015-1.18)	0.071	0.085 (0.008-0.9)	0.041
Housewife	1.38 (0.5-3.8)	0.52	0.94 (0.21-4.13)	0.94
Free job	0.81 (0.81-2.7)	0.73	0.94 (0.23-3.82)	0.93
Employee	Reference		Reference	
Housing situation				
Leasing	0.43 (0.16-1.15)	0.096	1.57 (0.73-3.37)	0.24
Personal	Reference		Reference	
Living location				
Urban	0.48 (0.25-0.91)	0.026	1.86 (0.63-5.45)	0.25
Rural	Reference		Reference	
Insurance status				
No	0.34 (0.14- 0.85)	0.021	0.51 (0.19- 1.35)	0.17
Yes	Reference		Reference	
Diabetes complications				
Yes	0.48 (0.24-0.95)	0.037	0.57 (0.26-1.25)	0.16
No	Reference		Reference	
Drug type				
Tablet	Reference		Reference	
Insulin	0.00	0.99	0.00	0.99
Both	0.46 (0.18-1.1)	0.098	0.73 (0.27-1.95)	0.53

Ethical Issues

This study received approval from the Ethical committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.187). The participants were informed about the purposes of the study prior to the administration of the questionnaires by the researcher. The participation in the study was voluntary and the informed consent was obtained from each diabetic patient.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authors Contributions

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