The Relationship with Acceptance of Illness and Medication Adherence in Type 2 Diabetes Mellitus Patients

Sevda Turen, RN, PhD

Assistant Professor of Internal Medicine Nursing, Department of Nursing, Faculty of Health Sciences, Istanbul Kultur University, Istanbul, Turkey

Rahime Atakoglu Yilmaz, RN, MSc.N

Research Assistant of Nursing,Department of Nursing, Faculty of Health Sciences, Istanbul Kultur University, Istanbul, Turkey

Seval Gundogdu, RN, MSc.N

Special Teaching Staff, Department of Cardiology, University of Health Sciences Istanbul Mehmet Akif Ersoy [a]

 Thoracic and Cardiovascular Surgery Training and Research Hospital, Istanbul, Turkey[b]

Correspondence: Sevda Turen, RN. PhD. Istanbul Kultur University Şirinevler Campus E5 Highway, No: 22 Bahçelievler Istanbul Turkey, E-mail**:** sevdamercanhm@hotmail.com

Abstract

Background: Diabetes mellitus (DM) gives rise to a variety of systemic complications which are associated with diminished expectancy and quality of life. Medication adherance and acceptance of illness are essential components of the care in the chronic diseases.

Objective: We sought to investigate the relationship between acceptance of illness and medication adherance in patients with Type 2 DM (T2DM).

Methodology: This is a cross-sectional study, designed to be descriptive and correlational. Data were collected using the data gatherig form, acceptance of illness scale (AIS) and medication adherence report scale (MARS).

Results: 345 patients included in the study. The mean age of the patients was 61.9±8.7 years (30- 83) and 66.7% of them were male. The mean duration of illness was 10.2±8.3 years. AIS score was significantly different with regard to duration of illness, gender, marital status, educational status, employment status, presence of diabetic complications and diabetes education (p <0.05). MARS score also showed significant difference with regard to regular physician visits (p <0.05). There was a significant and positive correlation between the AIS score and the MARS score (r=0.24; p <0.001). In addition, there was a statistically significant and positive correlation between a better glycemic control (HgA1C <7%) and the both AIS and MARS scores.

Conclusions: Acceptance of illness and medication adherence level of patients in this study were at a medium level. A significant and positive correlation was found between acceptance of the illness and medication adherance in patients with T2DM. Knowledge about the factors affecting the acceptance of illness and medication adherance will be useful in the training and counselling of the patients with T2DM.

Key words: Acceptance of illness, medication adherence, type 2 diabetes mellitus.

Introduction

Diabetes mellitus (DM) is a complex and chronic metabolic disorder that requires continuous medical care with multifactorial risk reduction strategies beyond glycemic control (ADA, 2021; TEMD, 2020). The prevalence of DM is increasing worldwide with the interaction of socio-economic, demographic, environmental and genetic factors and it emerges as one of the rapidly growing health problems of the 21st century. According to the data from 2019, it is estimated that 463 million adults worldwide are living with diabetes and this number will reach 700 million in 2045 (ADA, 2021; IDF, 2019). In Turkey, 42% of the adult population is estimated to be as diabetic or prediabetic (TEMD, 2020).

Healthy nutrition and weight control, physical activity, medication compliance and stress

management are vital components of the effective and successful self-management of Type 2 Diabetes Mellitus (T2DM) (Cunningham et al., 2018; TEMD, 2020). Compliance with the treatment can improve glycemic control and help patients avoid long-term complications of the DM (Alatawi et al., 2016; Hashimato et al., 2019). Medication adherance constitutes an important component of the treatment and also one of the most important determinants of the outcomes in patients with DM (Juraze et al., 2015). The World Health Organization reports that the medication adherance in chronic diseases is around 50% (WHO) (WHO, 2003). It has been reported in the studies that the good medicatian adherance is associated with a better control of risk factors, reduction in hospitalizations, healthcare costs and mortality in patients with DM (Asche et al., 2011; Hong & Kang, 2011; Marusic et al., 2018). On the other hand, poor medication adherence is associated with the worse quality of life as well as increased morbidity and mortality (Juarez et al., 2013; Kirkman et al., 2015).

Acceptance of the illness in chronic diseases such as diabetes is of great importance in coping with the disease (Büyükkaya Besen & Esen 2011). With the acceptance of the illness, it becomes easier for people with diabetes to make lifestyle changes and self-care practices, and to continue their treatment and care (Taşkın Yılmaz et al., 2019). Non acceptance of the disease may cause noncompliance, delay in the healing process or complications (Büyükkaya Besen & Esen 2011; Taşkın Yılmaz et al., 2019). Nurses have the chance to observe the difficulties experienced by diabetic individuals in close communication with the patient during the treatment and care interventions (Büyükkaya Besen & Esen 2011). Knowing the factors affecting medication adherance by the nurses, who have an important role in the education, treatment, follow-up and gaining self-care behaviors of the diabetic individual, will guide them in the management of the disease.

The aim of this study is to investigate the relationship between acceptance of illness and medication adherence in patients with T2DM.

Research Questions:

1. What is the acceptance of illness level of patients with T2DM?

2. What is the medication adherence level of patients with T2DM?

3. Is there a relationship between acceptance of illness and medication adherence?

Methodology: A cross-sectional study, designed to be descriptive and correlational, was conducted from August 2020 to February 2021. The population of the study consisted of patients who were followed up with the diagnosis of T2DM in a training and research hospital during this time period. The minimum sample size was determined by performing power analysis with the G * Power (v3.1.9.7) program. The minimum total sample size was found to be at least 159 in the analysis made to obtain a significance level of 0.05 (α) and a statistical test power of 80% (1-β). Patients over the age of 18, literate, diagnosed with T2DM by a physician at least three months ago and consenting to participate were included in the study. Patients with diabetes who were diagnosed with type 1 diabetes, developed secondary diabetes (surgical operation, pregnancy, etc.), had a psychiatric disorder diagnosed by a psychiatrist, were terminally ill and did not agree to participate in the study were excluded from the study. Four hundred eleven patients tith T2DM agreed to participate in the study. 33 of them were not included in the study because they were diagnosed in less than three months ago, four of them had psychiatric disorders, and two had Type 1 DM. Initially 372 patients were included in the study, but 27 patients were excluded from the study because of incomplete data entry, and finally the study population was consisted of 345 patients.

Data were collected using the data gathering form, Acceptance of Illness Scale (AIS) and Medication Adherence Report Scale (MARS). HbA1c levels of the patients were obtained through the medical records from the last laboratory results. The data were collected by the researchers through face-to-face interviews with the patients in a special room at outpatient clinic.

Data gathering form: The data gathering form was prepared by the researchers in the light of literature review. This form consisted of 16 questions regarding to socio-demographic characteristics (age, gender, marital status, education, economic status, etc.), disease information (duration of illness, comorbidities, treatment type, presence of chronic complications, etc.), diabetes education, and attendace to regular follow-up visits.

Acceptance of Illness Scale (AIS): The Acceptance of Illness Scale (AIS) was developed by Felton & Revenson (1984), and adapted into

Turkish language by Büyükkaya Besen & Esen (2011). It is a one-dimensional 5 point Likert-type scale consists of eight items. The lowest score obtained from the scale is 8, and the highest score is 40. Agreeing with the described statements in the scale is rated as a low score (1 point). This indicates the lack of acceptance of the disease and poor compliance. Disagreeing with the described statements is rated as a high score (5 point). This indicates the absence of negative feelings about the illness and acceptance of the illness. The 6th item of the scale is scored in reverse. A high score on the scale indicates compliance and less physical discomfort. In the Turkish validity and reliability study of the scale, the Cronbach alpha internal consistency coefficient was found to be 0.79. In this study, the Cronbach alpha value of the scale was determined as 0.96.

Medication Adherence Report Scale (MARS): Medication Adherence Report Scale (MARS) was developed by Horne & Weinman (2002) to assess drug compliance in chronic diseases and was adapted to Turkish language by Temeloğlu Şen et al. (2019). It is a one-dimensional 5 point Likert-type scale and the items are rated as follows; 5 = never, 4 = rarely, 3 = sometimes, 2 = often and 1 = very often. The total test score is determined by summing the scores obtained from the items.The scores obtained from the scale range from 5 to 25. Higher total scores indicates the better adherance, and the lower total scores indicates poor adherance. In the Turkish validity and reliability study of the scale, the Cronbach alpha internal consistency coefficient was found to be 0.78. In this study, the Cronbach's alpha value of the scale was determined to be 0.98.

Ethical considerations: The study conforms with the ethical principles outlined in the Declaration of Helsinki. Appropriate permissions were obtained from the institution where the study was conducted. Ethic comittee approval was obtained from the University Institutional Review Board (IRB date and number: 16.03.2020/2020.07). Written informed consent was obtained from patients who met the study criteria. The participants were assured that their responses would remain anonymous and confidential.

Statistical analysis: Continuous variables are expressed as means ± SD, and categorical variables are expressed as percentages. AIS and MARS scores of the patients were compared accross socio-demographic and diabetes related characteristics of the patients using student's t test and one-way analysis of variance (ANOVA). Post-Hoc analyses performed where appropriate using Bonferroni correction. Relationship between variables analysed by using Pearson corelation analyses. For all tests, two-sided *P* values <0.05 were considered as significant. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows (SPSS Inc, Chicago, Illinois, USA).

Results

Three hundred and forty-five patients included in the study. The mean age of the patients was 61.9 ± 8.7 years (30- 83) and 66.7% of them were male. Majority of the patients, 96.8% were living with a family member and 85.2% were married. 68.4% of the patients were primary school graduates and 82.9% were not working currently (Table 1). The mean duration of illness was 10.2 ± 8.3 years (6 months- 50 years) and 56.8% of them on oral antidiabetic treatment. Diabetic complications were present in 96.5% of the patients (Table 2).

The mean AIS score of the patients was 27.06 ± 9.57. They got the lowest mean score (2.78 ± 1.51) from the "I do not feel inadequate due to my health status" statement and highest mean score (4.67 ± 0.71) from the "I think people are mostly uncomfortable being with me because of my illness" statement (Table 3). The mean MARS scores of the patients was 19.29 ± 5.52.

The AIS scores of the patients were compared accross the socio-demographic and disease-related characteristics. AIS score was significantly different with regard to duration of illness, gender, marital status, educational status, employment status, presence of diabetic complications and diabetes education (*p* <0.05). MARS score also showed significant difference with regard to regular physician visits (*p* <0.05). There was a significant and positive correlation between the AIS score and the MARS score (*r*=0.24; *p* <0.001). In addition, there was a statistically significant and positive correlation between a better glycemic control (HgA1C < 7%) and the both AIS and MARS scores.

Table 1. Socio-demographic characteristics of patients

Variables	Frequency (n)	Percentage (%)
Age (year)		
30-64 years	205	59.4
≥ 65 years	140	40.6
Gender		
Female	115	33.3
Male	230	66.7
Marital status		
Married	294	85.2
Single	51	14.8
Education level		
Literate	52	15.1
Elementary school	236	68.4
High school	44	12.7
College degree	13	3.8
Working status		
Working	59	17.1
Not working	286	82.9
Economic status		
Income more than expenses	199	57.7
Income partially covers expenses	126	36.5
Income less than expenses	20	5.8
Health insurance		
Yes	338	98.0
No	7	2.0
Home status		
Living with a family member	334	96.8
Living alone	11	3.2

Table 2. Diabetes related characteristics of patients

Variables	Frequency (n)	Percentage (%)
Duration of illness (year)		
3 months - 5 years	124	35.9
6-10 years	98	28.4
11-15 years	58	16.8
≥ 16 years	65	18.8
Presence of comorbidities		
Yes	335	97.1
No	10	2.9
Present comorbidities		
CAD	266	77.1
HT	229	66.4
Valvular heart disease	44	12.8
HF	19	5.5
COPD	15	4.3
Has a first degree relative with DM		
Yes	212	61.4
No	133	38.6
Treatment		
OAD	196	56.8

Insülin	44	12.8
OAD and insülin	105	30.4
Presence of diabetic complication		
Cardiovascular	323	93.6
Neuropathy	164	47.5
Retinopathy	122	35.4
Nefropathy	101	29.3
Diabetic foot	51	14.8
None	12	3.5
Received diabetic education?		
Yes	151	43.8
No	194	56.2
Diabetic education given by?		
Nurse	54	15.7
Physician	21	6.1
Others	76	22.0
Regular physician visits?		
Yes	118	34.2
No	227	65.8
Frequency of physician visits		
Every 3 months	98	28.4
Every 6 months	18	5.2
Annually	2	0.6
A1C (%)		
< 7	96	27.2
≥ 7	249	72.8

*CAD: Coronary artery disease, **HT:** Hypertension, **HF:** Heart Failure, **COPD:** Chronic obstructive pulmonary disease, **OAD:** Oral antidiabetic

Table 3. Acceptance of illness scale (AIS) scores of patients and distribution of answers for each item

Statement	Scores min.-max.points	Mean ± SD
I have problems with adjusting to limitations imposed by the disease	1-5	3.07±1.45
Due to my health condition, I am not able to do what I like the most	1-5	3.07±1.45
Sometimes my illness makes me feel not needed	1-5	3.23±1.46
Health problems make me more dependent on others than I would like to be	1-5	3.23±1.49
The disease makes me a burden for my family and friends	1-5	3.64±1.29
I don't feel inadequate due to my health condition	1-5	2.78±1.51
I will never be as self-sufficient to the extent to which I would like to be	1-5	3.39±1.33
I beleive people that stay with me are often embarrassed because of my disease	1-5	4.67±0.71
Toplam Puan	10-40	27.06±9.57

*SD: Standard deviation

Table 4. Comparison of the mean AIS scores and MARS scores accross socio-demographic and diabetes related characteristics of patients included in the study

Variables	AIS Score	p	MARS Score	p
Age				
30-64 years	27.29±9.88	0.59	19.11±5.58	0.47
≥ 65 years	26.73±9.13		19.54±5.45	
Duration of illness (year)				
3 months - 5 years	31.12±9.31		19.22±5.58	
6-10 years	26.38±9.40	**<0.001***	19.38±5.61	0.93
11-15 years	23.33±8.42		18.96±5.82	
≥ 16 years	23.68±8.47		19.57±5.10	
Gender				
Female	24.87±9.39	**0.003***	19.00±5.75	0.49
Male	28.16±9.49		19.43±5.41	
Marital status				
Married	27.78±9.39	**0.001***	19.30±5.54	0.89
Single	22.88±9.63		19.19±5.51	
Education level				
Literate	23.48±9.27		18.92±5.57	
Elementary school	27.09±9.48	**0.004***	19.00±5.59	0.16
High school	30.11±9.86		20.73±5.01	
College degree	30.46±7.01		21.00±5.29	
Working status				
Working	30.27±8.99	**0.005***	18.54±6.18	0.25
Not working	26.40±9.57		19.44±5.38	
Home status				
Living with a family member	27.14±9.57	0.41	19.28±5.54	0.87
Living alone	24.73±9.59		19.54±5.18	
Presence of comorbidities				
Yes	26.90±9.48	0.06	19.28±5.52	0.90
No	32.50±11.50		19.50±5.99	
Has a first degree relative with DM				
Yes	26.52±9.44	0.39	18.91±5.73	0.72
No	23.78±10.50		18.22±5.91	
Presence of comorbidities				
Yes	26.71±9.54	**<0.001***	19.24±5.55	0.40
No	36.67±3.65		20.58±4.81	
Received diabetic education?				
Yes	28.92±8.94	**<0.001***	19.44±5.32	0.64
No	24.67±9.86		19.16±5.69	
Regular physician visits?				
Yes	27.83±9.16	0.27	21.32±4.26	**<0.001***
No	26.65±9.78		18.21±5.81	
A1C (%)				
< 7	30.35±9.72	**<0.001***	20.80±4.72	**0.001***
≥ 7	25.79±9.22		18.70±5.71	

***AIS:** Acceptance of illness scale, **DM:** Diabetes mellitus, **MARS:** Medication adherence report scale

Table 5. Correlations between the acceptance of illness level and medication adherence level and their correlations accross socio-demographic and dibetes related characteristics of patients

Variables	AIS score		MARS score	
	r	**p**	**r**	**p**
MARS score	0.24	**<0.001***	-	-
Age (year)	-0.03	0.51	0.08	0.09
Duration of illness (year)	-0.29	**<0.001***	0.01	0.77
Male gender	0.16	**0.003***	0.03	0.49
Being single	-0,18	**0.001***	-0.01	0.89
Working	0.15	**0.005***	0.06	0.25
Presence of diabetic complication	0,19	**0.001***	0.04	0.40
Received diabetic education	0,22	**<0.001***	0.02	0.64
Regular physician visits	0.05	0.27	0.27	**<0.001***
A1C (%) ≥ 7	-0.21	**<0.001***	-0,17	**0.001***

*r: Pearson correlation coefficient, p<0,05 is significant

***AIS:** Acceptance of illness scale, **MARS:** Medication adherence report scale

Discussion

Diabetes is increasing rapidly all over the world and T2DM constitutes approximately 90-95% of diabetes cases (ADA, 2021; IDF, 2019). Poor medication adherence is an obstacle in therapeutic control of diabetes (Awodele & Osuolale, 2015). Medication adherence improves glycemic control and clinical outcomes, and lowers T2DM treatment costs (Marusic et al., 2018). Acceptance of a chronic disease such as diabetes plays an important role in coping with the disease (Buyukkaya Besen & Esen 2011). This study was conducted to investigate the relationship between acceptance of the illness and medication adherence in patients with T2DM.

T2DM is a disease often seen after the age of 40 (ADA, 2021; TEMD, 2020). Tominaga et al. (2018) showed that advanced age is in a significant relationship with medication compliance. Mean age of the patients included in our study was 61.9 ± 8.7 years (min.30-max.83) and this was found to be in parallel with the literatüre (Bal Ozkaptan et al., 2019; Taskin Yılmaz et al., 2019). As the age increased, acceptance of illness was decreased (r = -0.03, p = 0.51) and medication adherance was increased, but this was not a statistically significant increase (Table 5).

The mean duration of illness of the patients found to be 10.2 ± 8.3 years (min.6 months-max.50 years), acceptance of illness level of the patients who had the disease duration of five years or less was found to be statistically significantly higher (p

<0.001) (Table 4). It was found that as the duration of the illness increased, the acceptance of the illness decreased (r =-0.29, p <0.001). There was no statistically significant correlation between the duration of the illness and the medication adherance level (r = 0.01, p = 0.77). In similar studies, a negative correlation was found between the duration of the illness and the acceptance of ilness level (Bal Ozkaptan et al., 2019; Taskin Yilmaz et al., 2019). This result is most likely due to effect of increased burden of the illnesse on acceptance of the illness as time passes.

Acceptance of illness level of the males was found to be statistically higher (p = 0.003). However, there was no statistically significant difference between the gender and the medication adherance level (Table 4). It is thought that the higher percentage of male gender (66.7%) in the study might have affected the results.

In the study conducted by Rezai et al. (2019), factors affecting medication adherence in patients with T2DM were evaluated, and it was shown that economic and social factors affect medication adherance. In the another study conducted by Demirbas & Kutlu (2020) on individuals using multiple drugs, the rate of treatment compliance was found to be higher in married individuals. It is also known that social support plays an important role in accepting the illness. In this study, in parallel with the literature, the medication adherence levels of married and working patients were found to be statistically higher (p = 0.001, p = 0.005, respectively) (Table 5).

Uncontrolled hyperglycemia can often lead to diabetic complications such as cardiovascular problems, neuropathy, retinopathy, nephropathy and diabetic foot (Alqarni et al., 2018; Awodele & Osuolale, 2015). One of the important factors in achieving good glycemic control (HgA1C <7) is a good medication adherance (ADA, 2021; Awodele & Osuolale, 2015; Capoccia et al, 2016). Diabetic complications were found in 96.5% of the patients included in this study (Table 2). There was a positive correlation with the presence of diabetic complications and the level of acceptance of illness ($r = 0.19$, $p = 0.001$). Although the medication adherance level was higher in patients without diabetic complications, no statistically significant difference was found. (Table 4). According to these results; it can be said that diabetic complications are effective in accepting the illness but do not affect medication adherance.

Education is crucial in the successful management of diabetes and improves clinical outcomes. In addition, the diabetic person's acceptance of their illness is critical in controlling the illness by encouraging lifestyle changes and self-care practices (Capoccia et al, 2016; Crvala et al., 2016; Marusic et al., 2018). In the study by Bal Ozkaptan et al. (2019) (N = 200), all patients received diabetes education and in the study by Taskin Yilmaz et al. (2019) (n = 156), 50.6% of the patients received diabetes education. In our study 43.8% of the patients received diabetes education and there was a significant correlation between acceptance of illness level and receiving diabetes education ($r = 0.22$, $p < 0.001$) (Table 5). According to this result, diabetes education seems to be effective on the illness acceptance level.

An important element of the effective and successful management of diabetes is adherance to medication (Awodele & Osuolale, 2015). The long-term medication adherance level of individuals with chronic diseases such as diabetes is reported to be approximately 50% (8). This leads to a decrease in the quality of life of individuals and an increase in use of health care services (Jaurez et al., 2013; Kirkman et al., 2015; Marusic et al., 2018). In the study by Alqarni et al. (2018) (n = 375), medication adherance of diabetic patients was found to be insufficient.

There was a significant correlation between regular physician visit and medication adherance ($p < 0.05$). This result implies that patients who are under regular physician follow-up can control their medications better.

In the study conducted by Taskin Yilmaz et al. (2019), It was found that individuals with high illness acceptance level had better glycemic control. In the study of Chrava et al. (2016), it was shown that diabetes education was effective in glycemic control. In our study, a statistically significant and positive correlation was found between both the illness acceptance level and the medication adherance level and good glycemic control (HgA1C ≤7) (Table 5). Comparing with similar studies (Bal Ozkaptan et al., 2019; Taskin Yilmaz et al., 2019), it was found that the mean AIS score (27.06 ± 9.57) and the mean MARS score (19.29 ± 5.52) of the patients were at a moderate level in our study.

The limitations of the study are that the research was carried out in a single center, in a certain period of time, and with individuals with T2DM who agreed to participate in the study. In addition, the data obtained about acceptance of illness is based on the self-report of the individuals.

Conclusion: Acceptance of illness level and medication adherence level of patients in this study were at a medium level. A significant and positive correlation was found between acceptance of the illness and medication adherance in patients with T2DM.Health professionals have an important responsibilities in medication adherance, which is an important component of diabetes management. Another important factor in ensuring medication adherence is the acceptance of the illness. We believe that the knowledge of the factors affecting the acceptance of illness and medication adherance obtained through the studies will be useful in the training and counselling of the patients with T2DM.

References

American Diabetes Association (ADA). (2021) 2. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2021. Diabetes Care, 44(1):S15-S33. https://doi.org/10.2337/dc21-S002.

Alatawi, Y. M., Kavookjian, J., Ekong, G., & Alrayees, M. M. (2016). The association between health beliefs and medication adherence among patients with type 2 diabetes. Research in Social & Administrative Pharmacy: RSAP, *12*(6), 914–925.

Alqarni, A. M., Alrahbeni, T., Qarni, A. A., & Qarni, H. (2018). Adherence to diabetes medication among diabetic patients in the Bisha governorate of Saudi Arabia - a cross-sectional survey. Patient Preference and Adherence, *13*, 63–71.

Asche, C., LaFleur, J., & Conner, C. (2011). A review of diabetes treatment adherence and the association

with clinical and economic outcomes. Clinical Therapeutics, *33*(1), 74–109.

Awodele, O., & Osuolale, J. A. (2015). Medication adherence in type 2 diabetes patients: study of patients in Alimosho General Hospital, Igando, Lagos, Nigeria. African Health Sciences, *15*(2), 513–522.

Bal Ozkaptan B, Kapucu S, Demirci İ. (2019). Relationship between adherence to treatment and acceptance of illness in patients with type 2 diabetes. Cukurova Medical Journal, 44(Suppl 1):447-454.

Buyukkaya Besen D, Esen A. (2011). The adaptation of the Acceptance of Illness Scale to the diabetic patients in Turkish Society (Original Work Published in Turkish) TAF Preventive Medicine Bulletin. 10:155-164.

Capoccia, K., Odegard, P. S., & Letassy, N. (2016). Medication adherence with diabetes medication: A systematic review of the literature. The Diabetes Educator, *42*(1), 34–71.

Chrvala, C. A., Sherr, D., & Lipman, R. D. (2016). Diabetes self-management education for adults with type 2 diabetes mellitus: A systematic review of the effect on glycemic control. Patient Education and Counseling, 99(6), 926–943.

Cunningham, A. T., Crittendon, D. R., White, N., Mills, G. D., Diaz, V., & LaNoue, M. D. (2018). The effect of diabetes self-management education on HbA1c and quality of life in African-Americans: a systematic review and meta-analysis. BMC Health Services Research, 18(1), 367.

Demirbas N, Kutlu R. (2020). Treatment adherence and self-efficacy levels of adults using multiple drugs. (Original Work Published in Turkish) Ankara Medical Journal, 2):269-280

Felton, B. J., & Revenson, T. A. (1984). Coping with chronic illness: a study of illness controllability and the influence of coping strategies on psychological adjustment. Journal of Consulting and Clinical Psychology, 52(3), 343–353.

Hashimoto, K., Urata, K., Yoshida, A., Horiuchi, R., Yamaaki, N., Yagi, K., & Arai, K. (2019). The relationship between patients' perception of type 2 diabetes and medication adherence: a cross-sectional study in Japan. Journal of Pharmaceutical Health Care and Sciences, 5, 2. https://doi.org/10.1186/s40780-019-0132-8

Hong, J. S., & Kang, H. C. (2011). Relationship between oral antihyperglycemic medication adherence and hospitalization, mortality, and healthcare costs in adult ambulatory care patients with type 2 diabetes in South Korea. Medical Care, *49*(4), 378–384.

Horne R, Weinman J. (2002). Self-regulation and self-management in asthma: exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventer medication. Psychology & Health, 17:17-32.

International Diabetes Federation (IDF) Diabetes Atlas 2019 https://diabetesatlas.org/en/sections/worldwide-toll-of-diabetes.html

Juarez, D. T., Tan, C., Davis, J., & Mau, M. (2013). Factors affecting sustained medication adherence and its impact on health care utilization in patients with diabetes. *Journal of pharmaceutical health services research : an official journal of the Royal Pharmaceutical Society of Great Britain, 4*(2), 89–94.

Kirkman, M. S., Rowan-Martin, M. T., Levin, R., Fonseca, V. A., Schmittdiel, J. A., Herman, W. H., & Aubert, R. E. (2015). Determinants of adherence to diabetes medications: findings from a large pharmacy claims database. Diabetes Care, *38*(4), 604–609. https://doi.org/10.2337/dc14-2098

Marusic, S., Melis, P., Lucijanić, M., Grgurević, I., Turcic, P., Neto, P., & Bilic-Ćurcic, I. (2018). Impact of pharmacotherapeutic education on medication adherence and adverse outcomes in patients with type 2 diabetes mellitus: a prospective, randomized study. Croatian Medical Journal, *59*(6), 290–297.

Rezaei, M., Valiee, S., Tahan, M., Ebtekar, F., & Ghanei Gheshlagh, R. (2019). Barriers of medication adherence in patients with type-2 diabetes: a pilot qualitative study. Diabetes, Metabolic Syndrome and Obesity : Targets and Therapy, *12*, 589–599.

Taskin Yilmaz F, Sahin DA, Türesin AK. (2019). Relationship with glycemic control and acceptance of illness in type 2 diabetic individuals. (Original Work Published in Turkish) Cukurova Medical Journal, 44(4):1284-1291.

Temeloglu Sen E, Sertel Berk O, Sindel D. (2019). The validity and reliability study of the Turkish adaptation of the medical adherence report scale. (Original Work Published in Turkish) Journal of Istanbul Faculty of Medicine, 82(1):52-61.

Tominaga, Y., Aomori, T., Hayakawa, T., Kijima, N., Morisky, D. E., Takahashi, K., & Mochizuki, M. (2018). Possible associations of personality traits representing harm avoidance and self-directedness with medication adherence in Japanese patients with type 2 diabetes. Journal of Pharmaceutical Health Care and Sciences, *4*, 16. https://doi.org/10.1186/s40780-018-0112-4

Turkiye Endokrinoloji ve Metabolizma Derneği (TEMD) Diabetes Mellitus ve Komplikasyonlarının Tanı, Tedavi ve İzlem Kılavuzu-2020, 14. Baskı Ankara, 2020. (Original Work Published in Turkish) Avaible from: https://temd.org.tr/admin/uploads/tbl_kilavuz/2020 0625154506-2020tbl_kilavuz86bf012d90.pdf

World Health Organization. Adherence to long-term therapies: Evidence for action. World Health Organization, Geneva, Switzerland 2003.