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DIABETIC PATIENTS' COMPLIANCE WITH TREATMENT DURING COVID-19 PANDEMIC PERIOD

COVID-19 PANDEMİ DÖNEMİNDE DİYABET HASTASININ TEDAVİYE UYUM DURUMUNUN DEĞERLENDİRİLMESİ

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ABSTRACT

Objective: Diabetes mellitus is a chronic, complex disease with many components that must be managed. Treatment success depends on excellent treatment compliance. In this study, we aimed to evaluate the treatment adherence of diabetic patients during the COVID-19 (Coronavirus Disease) pandemic and the factors affecting this condition.

Material and Methods: The study was carried out on 474 diabetic patients with a questionnaire consisting of questions based on The Medication Compliance Questionnaire (MCQ) and the World Health Organization (WHO) 2003 compliance guideline.

Results: The rate of non-compliance with the treatment based on the MCQ scale was 82.3%. Non-compliance with treatment was significantly associated with oral antidiabetic (OAD) drug use, smoking status, glycosylated hemoglobin (HbA1c) <7%, and patient comments of "I don't have regular doctor follow-up," "I can't communicate well with my doctor," "My blood glucose is not at the target value," and "My medications are not comfortable enough for use"(p=0.011; 0.010; 0.014; 0.011; 0.002; 0.019; 0.001). Patients under insulin treatment or with an HbA1c value of ≥7% were found to be more compliant with the treatment.

Conclusion: Unlike the classical results, the incompatibility of diabetic patients with HbA1c <7% and under OADs with the treatment was emphasized. Patients using insulin and with advanced duration of diabetes were more compliant with the treatment in the stressful period of the COVID-19 pandemic. Lack of follow-up by the doctor and low patient effort to communicate with the doctor have been decisive factors in the non-compliance.

Keywords: Diabetes mellitus, compliance, HbA1c, oral antiglycemic agent

ÖZET

Amaç: Diyabet, yönetimi çok bileşenli olan kronik, kompleks bir hastalıktır. Tedavi başarısı ancak iyi bir tedavi uyumuyla sağlanabilmektedir. Bu çalışmada, diyabet hastalarının COVID-19 (Koronavirüs hastalığı) pandemisi döneminde tedaviye uyum durumu ve bu durumu etkileyen faktörlerin değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Çalışma, The Medication Compliance Questionnaire (MCQ) ve Dünya Sağlık Örgütü (DSÖ) uyum klavuzu 2003'e göre belirlenmiş sorularından oluşan bir anket ile 474 diyabetik hasta ile gerçekleştirilmiştir.

Bulgular: MCQ ölçeğine göre tedaviye uyumsuzluk oranı %82,3 idi. Tedaviye uyumsuzluk, oral antidiyabetik (OAD) ilaç kullanımı, sigara içme durumu, glukolize hemoglobinin (HbA1c) <%7 olması ve hasta yorum sorularından; ''düzenli doktor takibim yok'',"doktorumla iyi iletişim kuramıyorum", ''şekerim belirlenen hedef değerde değil'',"ilaçlarım kullanım yönünden yeterince konforlu değil" ifadeleriyle ilişkili bulunmuştur (p=0,011; 0,010; 0,014; 0,011; 0,002; 0,019; 0,000). İnsülin kullanan, HbA1c değeri ≥%7 olan hastalar ise tedaviye daha uyumlu olarak tespit edilmiştir.

Sonuç: Bu çalışmada klasik sonuçlardan farklı olarak HbA1c <%7 ve OAD kullanmakta olan diyabetik hastaların uyumsuzluğu gündeme getirilmiştir. COVID-19 pandemisi döneminde insülin kullanan ve hastalık süresi uzun olan hastalar tedaviye daha bağlı kalmışlardır. Doktor takibinin olmaması ve doktorla iyi iletişim kuramama uyumsuzluk açısından belirleyici olmuştur.

Anahtar Kelimeler: Diyabetes mellitus, tedavi uyumu, HbA1c, oral antidiyabetik ilaç

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INTRODUCTION

Coronavirus Disease 2019 (COVID-19), caused by Severe Acute Respiratory Syndrome-2 (SARS-CoV-2), was determined to be a new coronavirus agent. The virus was defined in Wuhan, China and declared a pandemic by the World Health Organization (WHO) in early March 2020 (1).

Diabetes is known to be another global epidemic, and the incidence of the disease is increasing very fast. According to 2019 data, diabetes mellitus (DM) is a chronic disease affecting approximately 9% of adults, causing an important health problem (2, 3). Although it is known that diabetic patients are susceptible to COVID-19 infection, only 12-20% of diabetic patients were infected with COVID-19 (3). Nevertheless, the risk and severity of infectious diseases and the rate of complications can be reduced by providing good glycemic control in diabetic patients (2).

In chronic diseases such as diabetes, treatment compliance is a decisive factor that ensures the success of treatment (4, 5). Poor compliance with the treatment recommendations results in individual, social, and economic costs (6). According to the WHO 2003 compliance guideline, compliance is a multidimensional situation and occurs with the interaction of five factors; 1-patient, 2-social and economic, 3-related to the disease state, 4-related to the health system, 5-related to treatment (6).

Metabolic control in diabetic patients is closely related to patients' attitudes (7). In addition, many other factors also affect drug treatment compliance, including the complexity of treatments, lack of knowledge, presence of co-morbidities, side effects of drugs, and patient's well-being (8). Diabetic patients may be affected by disorders in some conditions such as medication delivery, blood glucose monitoring, regular outdoor sports, and diet compliance due to the sudden COVID-19 pandemic. The information concerning the effects of COVID-19 pandemic quarantine on glycemic control is conflicting (3,9). Home quarantine causes fear in many patients and prevent these patients from going to the clinic. Throughout the COVID-19 pandemic, to reduce the spread, many hospitals have reduced their capacity for outpatients. Diabetic patients could not go to their routine check-ups during quarantine and treatment could not be rescheduled under these stressed conditions. Therefore, after the pandemic, the health system may have to deal with the burden of acute and chronic complications due to poor glycemic control. To prevent this, self-management of diabetic patients during home quarantine is very important (3).

The aim of this study was to evaluate treatment compliance status and the factors affecting this situation in diabetic patients during the COVID-19 pandemic.

MATERIAL AND METHODS

According to our Power analysis using the G*Power program, when we took the difference between the rates of non-compliance with treatment according to age as D=20.6%, the minimum sample number determined for Power: 0.80 and alpha: 0.05 was determined to be 198.

This was a cross-sectional study. It was conducted with 474 diabetic patients admitted to the secondary level state hospital between 05.11.2020 and 05.11.2021.

Written consent was obtained after all patients were informed. The data was collected with a questionnaire consisting of two parts. One of them was the Medication Compliance Questionnaire (MCQ) scale and the other part was interpretation questions based on the WHO 2003 compliance guideline. In outpatient clinics, face-to-face interviews were performed with the patients by the internal medicine doctors, and the answers were recorded. An average of 15-20 minutes was allocated for each patient for the questionnaire. All type 1 and type 2 diabetic patients, diagnosed according to the American Diabetes Society (ADA) 2021 guideline, who were over 18 years old and under antidiabetic medications were included in the study (10). The data were recorded without changing the treatments used. Patients with incomplete records, who had been diagnosed with diabetes for less than 6 months, who were having acute complications, or who were unable to answer the questions due to mental problems were excluded from the study. Patients' socio-demographic and laboratory data, clinical features, comorbidities, diabetes-related complications, and medications were recorded.

The MCQ scale, which is an approved questionnaire for drug compliance, was used. Permission was obtained from the corresponding author for the use of the scale (8, 11). The adaptation of the questionnaire into Turkish was carried out by this paper's study team. The Cronbach's alpha coefficient showing the internal consistency of the scale is 92.1%.

In our study, the MCQ scale developed from different studies was used (12-14). The MCQ scale consists of seven questions in total that aim to evaluate the non-compliance of patients with their drug treatments. A four-point Likert scale was used for every question. Accordingly: Never, 4 points; Sometimes (1-4 times in a month), 3 points; Most of the time (≥5 per month or ≥2 per week), 2 points; Always, 1 point. Total scores were 7 to 28 for a patient. ≥27 rated as compliant, <27 incompatible (8).

According to the WHO 2003 compliance guideline, the factors affecting compliance were examined under five headings, and comment questions for the pandemic period were added to these subheadings. This section was

specified as the second section of the questionnaire. Under these subheadings the following factors were evaluated: 1) patient factors: gender, body mass index (BMI), age, diet compliance status, ability to do sports (regular outdoor sports), and compliance with personal hygiene and hygiene rules during the pandemic; 2) social and economic factors: education, marital status, occupation, monthly income, family support, good communication with the doctor, "my blood glucose is at the determined target value," and "my medications are comfortable in terms of use"; 3) factors related to the disease status: smoking, comorbidities, complications, HbA1c value, and COVID-19 status; 4) factors related to the health care team and system: the condition of regular doctor follow-ups during the pandemic; 5) factors related to treatment: duration of diabetes (treatment period) and drugs used (6).

Ethics committee approval was optained from Dr. Cemil Taşcıoğlu City Hospital for the study (Date: 03.11.2020, No: 386). Our study was carried out following the Declaration of Helsinki.

Statistical analyses

IBM SPSS Statistics version 22 software (IBM Corp., Armonk, NY, USA) program was used for statistical evaluation. With the Kolmogorov-Smirnov Test, the conformity of the parameters to the normal distribution was evaluated. Data were evaluated with Continuity (Yates) Correction and Chi-Square Test. Logistic regression analysis was applied for multivariate analysis. $p<0.05$ value was considered as statistically significant.

RESULTS

The ages of the 474 patients evaluated were between 25 and 93 years (mean age=59.25±11.81). The mean glycosylated hemoglobin (HbA1c) level of the patients was 8.55±2.55% (median=7.6%). Mean duration of diabetes of the patients was 9.02±7.72 years (median=7) (Table 1).

Table 1: Demographic and clinical features

Socio-demographic features			
Age interval (year), mean±SD		25-93	59.25±11.81
BMI interval, mean±SD		16.7-57.5	31.03±5.72
Gender n	Female	285	60.1
	Male	189	39.9
Education n	Illiterate	43	9.1
	Primary school	347	73.2
	High school	69	14.6
	University and higher	15	3.2
Marital status n	Single	116	24.5
	Married	358	75.5
Working status n	Not working in the pandemic	414	87.3
	Working	60	12.7
Monthly income n	Below minimum wage	236	49.8
	Equal or more	238	50.2
Smoking n	No	399	84.2
	Yes	75	15.8
Clinical features			
HbA1c interval (%), mean±SD (median)			8.55±2.55 (7.6)
FBG interval (mg/dL), mean±SD (median)			165.95±75.19 (143)
PPBG interval (mg/dL), Mean±SD (median)			228.78±102.52 (200)
DM period (treatment duration) year, Mean±SD (median)			9.02±7.72 (7)

SD: standard deviation, BMI: body mass index, HbA1c: glycosylated hemoglobin 1c, FPG: fasting plasma glucose, PPBG: postprandial plasma glucose, DM: diabetes mellitus

As for the forms of treatment, 64.3% of the cases were under oral antidiabetic (OAD) drug treatment, 21.9% were using OAD and insulin, and 13.5% were using insulin alone.

The mean MCQ score was 21.94±5.76 (median=24). According to the MCQ scale classification, 82.3% (n=390) of the cases were non-compliant with the treatment (Table 2).

The non-compliance of the patients who used the expressions ''My blood glucose is not at the specified target value'' and/or "my medications are not comfortable enough in terms of use" was statistically significant (p=0.019; 0.001). Comorbidities, complications, and COVID-19 states could not be associated with non-compliance with treatment (p=0.813; 0.274; 0.295). Also, smoking was found to be one of the determining factors for non-compliance (p=0.01) (Table 3).

Non-compliance was higher in patients with HbA1c levels <7% (p=0.014) and patients with HbA1c values ≥7% were more compliant with the treatment. The cases who stated that they were not under regular doctor follow-up during the pandemic were more non-compliant with the treatment (p=0.011). When patients were grouped according to the drugs used, statistically significant for non-compliance (p=0.011). Patients using insulin were more compliant with the treatment (Table 3).

When we evaluated the effects of the parameters on non-compliance with treatment; smoking, HbA1c value, drugs used, and the comments "I don't have regular doctor follow-up in the pandemic, I can't communicate well with my doctor, my blood glucose is not at the specified target value, my medications are not comfortable enough for use" with Backward stepwise logistic regression analysis, the model was important (p=0.001). The Negelkerke R square value of 0.162 was detected, and descriptive of the model (82.3%) was found to be at a good level. The effects of all these parameters, except drugs used, were important on the model (p<0.05) (Table 4).

Table 2: The Medication Compliance Questionnaire (MCQ) score*

	MCQ	
Questions	**Mean±SD**	**Median**
Q1 (How often do you forget to take your medicine?)	3.11±0.9	3
Q2 (How often do you decide not to take your medicine?)	3.07±1.11	4
Q3 (How often do you miss taking your medicine because you feel better?)	3.23±0.98	4
Q4 (How often do you decide to take less of your medicine?)	2.86±1.08	3
Q5 (How often do you stop taking your medicine because you feel sick due to effects of the medicine?)	3.22±1	4
Q6 (How often do you forget to bring along your medicine when you travel away from home?)	3.18±0.93	3
Q7 (How often do you not take your medicine because you run out of it at home?)	3.34±0.98	4
Total MCQ score	21.94±5.76	24
MCQ Score	**n**	**%**
Incompatible	390	82.3
Compatible	84	17.7

*: There are 7 MCQ questions. A score of 27 and above is compatible. Below 27 is incompatible (11).

DISCUSSION

In our study, using the MCQ scale, we found that 82.3% of the diabetic patients were non-compliant with treatment. Before the COVID-19 pandemic, compliance was a problem in diabetic patients and the compliance rate was usually 30-70% (15). Non-compliance rates were reported to be 27.1% in Southern Brazil, 28% in New York, 28.9% in Uganda, 36% in Mexico, and around 59% in Nigeria (5). In a study conducted with diabetic patients in Turkiye in 2015, the rate of non-compliance was found to be 44.7% (16). In other studies conducted in Turkiye, the rate of treatment compliance was found to be moderate or just above moderate (5, 7, 8).

As a result of good compliance with treatment, clinical outcomes improve, and quality of life is positively affected. The costs of disability and death decrease, and the number of hospital admissions and emergency admissions decrease. On the other hand, non-compliance is called the "invisible epidemic". It is a frequent occurrence with chronic diseases and an important public health issue (5).

In order to prevent the spread of the disease, curfews were ordered in many countries during the COVID-19 pandemic. Millions of people had to stay at home for this reason (17). In a study conducted during the COVID-19 pandemic on hypertensive and diabetic cases in Epitopia, non-compliance with treatment was found to be 72% (19). In another study conducted during the COVID-19 pandemic period, 74.46% of type 2 and 64.89% of type 1 diabetics were regarded as having poor glycemic control (3). In a study conducted on diabetic patients in Saudi Arabia, compliance was 18.5% before the COVID-19 quarantine and 17.4% after quarantine (18).

Table 3: Evaluation of study parameters in terms of the Medication Compliance Questionnaire (MCQ) compliance

		MCQ		p
		Non-compliance (n=390)	Compliance (n=84)	
Demographic features		**n (%)**	**n (%)**	
1-Patient related factors				
Age	< 65 years	263 (82.4)	56 (17.6)	[1]0.892
	≥ 65 years	127 (81.9)	28 (18.1)	
Gender	Female	236 (82.8)	49 (17.2)	[1]0.711
	Male	154 (81.5)	35 (18.5)	
BMI	Non-obese	181 (81.5)	41 (18.5)	[1]0.689
	Obese	209 (82.9)	43 (17.1)	
Diet compliance in pandemic	No	242 (83.2)	49 (16.8)	[1]0.526
	Yes	148 (80.9)	35 (19.1)	
Sports in pandemic (regular outdoor sports)	No	298 (80.5)	72 (19.5)	[2]0.085
	Yes	92 (88.5)	12 (11.5)	
Personal hygiene in the pandemic	No	27 (79.4)	7 (20.6)	[2]0.825
	Yes	363 (82.5)	77 (17.5)	
2-Social and economic factors				
Education	Illiterate	34 (79.1)	9 (20.9)	[1]0.278
	Primary school	286 (82.4)	61 (17.6)	
	High school	60 (87)	9 (13)	
	University and higher	10 (66.7)	5 (33.3)	
Marital status	Single	89 (76.7)	27 (23.3)	[1]0.071
	Married	301 (841)	57 (15.9)	
Working status	Not working in the pandemic	344 (83.1)	70 (16.9)	[2]0.300
	Working	46 (76.7)	14 (23.3)	
Monthly income	Below minimum wage	194 (82.2)	42 (17.8)	[1]0.966
	Equal or more	196 (82.4)	42 (17.6)	
Family support	Absent	115 (87.8)	16 (12.2)	[2]0.071
	Present	275 (80.2)	68 (19.8)	
Good communication with the doctor	Absent	160 (89.4)	19 (10.6)	**[2]0.002***
	Present	230 (78)	65 (22)	
My blood glucose is at the determined target values	No	199 (86.5)	31 (13.5)	**[1]0.019***
	Yes	191 (78.3)	53 (21.7)	
Medicines are comfortable to use	No	93 (95.9)	4 (4.1)	**[2]0.000***
	Yes	297 (78.8)	80 (21.2)	

Table 3: Continue

		MCQ		p
		Non-compliance (n=390)	Compliance (n=84)	
		n (%)	n (%)	
3-Disease associated factors				
Smoking	No	320 (80.2)	79 (19.8)	[2]**0.010***
	Yes	70 (93.3)	5 (6.7)	
Comorbidities	No	222 (81.9)	49 (18.1)	[1]0.813
	Yes	168 (82.8)	35 (17.2)	
Complications	No	301 (81.1)	70 (18.9)	[2]0.274
	Yes	89 (86.4)	14 (13.6)	
HbA1c (%)	<7	146 (88.5)	19 (11.5)	[2]**0.014***
	≥7	244 (79)	65 (21)	
COVID-19 history	No	331 (81.5)	75 (18.5)	[2]0.295
	Yes	59 (86.8)	9 (13.2)	
4-Factors related to the health system				
Regular doctor follow-up in the pandemic	Absent	302 (84.8)	54 (15.2)	[1]**0.011***
	Present	88 (74.6)	30 (25.4)	
5-Treatment related factors				
DM period (Treatment duration)	under 10 years	222 (80.1)	55 (19.9)	[1]0.295
	10-20 years	120 (86.3)	19 (13.7)	
	20 years and over	48 (82.8)	10 (17.2)	
Medications	OAD	263 (85.9)	43 (14.1)	[1]**0.011***
	insulin	46 (71.9)	18 (28.1)	
	OAD-Insulin use	81 (77.9)	23 (22.1)	

[1]: Chi-square test, [2]: Continuity (Yates) correction, *: a value of p<0.05 is significant, MCQ: Medication Compliance Questionnaire, BMI: body mass index, HbA1c: glycosylated hemoglobin, COVID-19: Coronavirus disease, DM: diabetes mellitus, OAD: oral antidiabetic

Table 4: Evaluation of the effects of the parameters that cause non-compliance with treatment by logistic regression

		95% CI		
Step 2	**OR**	**Lower Bound**	**Upper Bound**	**p**
Smoking	2.823	1.076	7.403	**0.035***
HbA1c < 7%	2.115	1.165	3.84	**0.014***
Lack of regular doctor follow-up in the pandemic	1.716	0.995	2.958	**0.048***
Poor communication with doctor	1.938	1.085	3.462	**0.025***
Absence of blood glucose in expected target values	1.849	1.081	3.163	**0.025***
The inconvenience of drugs used	5.356	1.862	15.405	**0.002***

*: a value of p<0.05 is significant. Parameters included in the model: smoking, HbA1c: glycosylated hemoglobin, doctor follow-up during the pandemic, medications used, doctor support, blood glucose at target values, comfortable use of drugs.

We found that non-compliance was higher in patients using OAD. Similarly, in previous studies, patients using insulin were more compliant with their treatments (5, 20). However, in another study, as the frequency of daily insulin use increased, treatment compliance decreased (16). There is also a study stating that there is no significant association of the number of medications taken, or OAD or insulin use with compliance with treatment (8). Compliance with oral hypoglycemic agents was attributed to some factors. It has been shown that poor communication negatively affects compliance with OAD therapy and glucose monitoring in type 2 diabetic patients (6). In a previous study, problems associated with drug therapy were detected in 42.3% of diabetic patients (15). Some of the obstacles to the use of OADs were stress, forgetfulness, not being sufficiently aware of the course of diabetes, belief in OADs, the high number of drugs used, poor communication with health care practitioners, the perception that the effect of OAD is weak, the presence of concomitant diseases, and old age (21).

In this study, patients with HbA1c <7% were more discordant to the treatment. In a study examining the compliance of diabetic patients with treatment, HbA1c values were not different between groups (22). Conversely, in some studies, it was emphasized that the higher the treatment compliance, the lower the HbA1c levels (2). In addition, in a study conducted during the COVID-19 quarantine, a statistically insignificant increase in HbA1c, fasting, and postprandial blood glucose levels was observed (23). In a different study, the treatment compliance score was found to be higher in those with an HbA1c value below 7.5%, however there was no statistical difference (22). The higher discordance defined in patients with HbA1c <7% in our study may be associated with a short period having passed after the diagnosis, or discontinuation of drugs due to the absence of complications and comorbid conditions. In addition, HbA1c may not be a suitable parameter to be used in stressful situations such as a pandemic. Self-confidence and uncontrolled continuation of treatment may be another factor in diabetic patients who were under insulin treatment for a long time. When the patients' symptoms related to the disease disappear, the patients cease to use their medications or become non-compliant by reducing them. On the contrary, as the patients' diseases worsen, the patients adapt more to their treatment. It is stated that patients with high blood glucose levels are more likely to remain compliant with treatment than those with regular blood glucose levels. In a previous study, as in our study, patients with HbA1c >7 were more likely to comply with treatment (5). Moreover, it has been stated that patients who were minimally affected by the course of diabetes have less compliance. No complications in cases with early diabetes were another factor for non-compliance (5).

In a study that was similar to ours, age, gender, education, income, diabetes duration, type of treatment, complications, and comorbidities were not associated with treatment compliance (5). In addition, it was emphasized in another study that factors such as gender, duration of diabetes, training status, BMI, and the number of drugs used were not the determinants of treatment compliance (8).

In this study, smokers were more non-adherent to the treatment. It has also been stated that smoking increases the patient's stress level and impairs drug intake (24). The absence of regular doctor follow-up, inability to communicate well with the doctor, blood glucose level not being at the determined target value, insufficient comfort with the use of drugs, and absence of doctor follow-up in the pandemic were associated with non-compliance with the treatment. It was stated in a study that if the patient-physician relationship is good, treatment compliance increases 2.26 times (5). It has been shown that directorial factors such as continuous follow-up and time spent with the doctor, and the doctor's communication style outweigh characteristics such as weight, height, and education (6). It is stated that if patients' knowledge about their diseases and the drugs increases, their compliance with treatment increases. This can only be achieved as a result of patients receiving more counseling and interacting with healthcare professionals (11). It is emphasized that stressful situations such as war affect treatment compliance and the effects of this situation continue even after the war is over. The reasons for this are shown as economic distress and interruption of medical follow-up (6).

The quality of life, physical, social, and mental conditions of diabetic patients have deteriorated under extraordinary conditions such as the COVID-19 pandemic. It is emphasized that in the presence of disasters that negatively affect life with chronic diseases, the quality of life deteriorates and vulnerable groups should be monitored more closely (23). Person-to-person transmission was prevented during the COVID-19 pandemic by taking strict public health measures. However, people's lifestyles, mental states, and behaviors are negatively affected by this situation (25).

However, there is a need for innovative practices with independent physician studies instead of structured traditional systems (6). Services supporting diabetic patients via telephone and e-mail during the COVID-19 quarantine have been more accessible for patients who have difficulty going to the clinic (9). The continuing COVID-19 outbreak emphasizes the significance of electronic health records and the need for electronic health records to be remote. Thus, it could provide valuable input for strengthening general health service delivery in the coming years (26).

There are some limitations in our study. Firstly, it does not reflect the whole society because it is a single center.

Interpretation questions such as, "I cannot communicate well with the doctor," and "I think my medications are not comfortable enough" were evaluated according to the patients' responses. The patient's perception at that moment and the state of being affected by the hospital environment may have affected the response. The HbA1c value is the value when the patient applied to the hospital and does not reflect the current values. Although there were adaptation studies conducted before the pandemic, the comparison could not be fully achieved due to the lack of a study using the same place and scale. Also, in OAD drug use, drugs could not be specified in detail and it has not been determined which type of OAD was affecting incompatibility. Another limitation of our study is that patients could not be evaluated in terms of hypoglycemia.

CONCLUSION

The expected results in classical adaptation studies focus on the incompatibility of patients with HbA1c >7% and patients using insulin. Our study contributed to the literature by providing a different approach, because we emphasized the non-compliance with treatment of diabetic patients who use OAD drugs and have HbA1c <7%. HbA1c <7% is a desired condition in which blood glucose is under control. However, this may not indicate that all is well. This patient group, which decides that doctor follow-up is insufficient, may be using many medications containing combinational medications. Also, patients may be exposed to hypoglycemia. In the long term, this will cause complications and increased health expenditures. Further studies are warranted explaining acute complications such as hypoglycemia, analyzing sub-groups of OAD agents, and exploring the behaviors of insulin-using diabetic patients who are more treatment-compatible in the COVID-19 pandemic. It would also be useful to analyze in detail patients with HbA1c <7%.

Ethics Committee Approval: This study was approved by Prof. Dr. Cemil Tascioglu Education and Research Hospital Ethics Committee (Date: 03.11.2020, No: 386).

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REFERENCES

1. World Health Organization. Clinical management. 2021 (January 25 2021). https://www.who.int.
2. Kutlutürk F. COVID-19 pandemisi ve diabetes mellitus. Türk Diyab Obez 2020;2:130-7. [CrossRef]
3. Tao J, Gao L, Liu Q, Dong K, Huang J, Peng X, et al. Factors contributing to glycemic control in diabetes mellitus patients complying with home quarantine during the coronavirus disease 2019 (COVID-19) epidemic. Diabetes Res Clin Pract 2020;170:108514. [CrossRef]
4. American Diabetes Association. Standards of medical care in diabetes. 2020 (January 2020). https://www.diabetes.org
5. Taşkaya S. Diyabet hastalarının tedaviye uyum düzeyleri ile sağlık hizmeti kullanımı ve yaşam kalitesini etkileyen faktörler (doktora tezi). Ankara: Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Sağlık Kurumları Yönetimi Programı. 2014.
6. World Health Organization. Adherence to long-term therapies: Evidence for action. 2003. https://www.who.int.
7. Ağralı H, Akyar I. Older diabetic patients attitudes and beliefs about health and illness. J Clin Nurs 2014;23(21-22):3077-86. [CrossRef]
8. Ahmad NS, Ramli A, Islahudin F, Paraidathathu T. Medication adherence in patients with type 2 diabetes mellitus treated at primary health clinics in Malaysia. Patient Prefer Adherence 2013;7:525-30. [CrossRef]
9. Avari P, Unsworth R, Rilstone S, Uduku C, Logan KM, Hill NE, et al. Improved glycaemia during the COVID-19 pandemic lockdown is sustained postlockdown and during the "eat out to help out" government scheme, in adults with type 1 diabetes in the United Kingdom. PLoS One 2021;16(7):e0254951. [CrossRef]
10. American Diabetes Association. Standards of Medical Care in diabetes. 2021(January 2020). https://www.diabetes.org.
11. Ramli A, Ahmad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. Patient Prefer Adherence 2012;6:613-22. [CrossRef]
12. Morisky DE, Green DE, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care 1986;24(1):67-74. [CrossRef]
13. Krousel-Wood M, Muntner P, Jannu A, Desalvo K, Re RN. Reliability of a medication adherence measure in an outpatient setting. Am J Med Sci 2005;330(3):128-33. [CrossRef]
14. SödergårdB, Halvarsson M, Tully MP, Mindouri S, Nordström ML,Lindbäck S, et al. Adherence to treatment in Swedish HIV-infected patients. J Clin Pharm Ther 2006;31(6):605-16. [CrossRef]
15. Demoz GT, Berha AB, Woldu MA, Yifter H, Shibeshi W, Engidawork E. Drug therapy problems, medication adherence and treatment satisfaction among diabetic patients on follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. PLoS One 2019;14(10):e0222985. [CrossRef]
16. Ölmez B.Tip 2 diyabetes mellitus'da kronik hastalık bakımı ve ilaç uyumunun değerlendirilmesi (uzmanlık tezi). Ankara: Ankara Atatürk Eğitim ve Araştırma Hastanesi. 2015.
17. Sankar P, Ahmed WN, Koshy VM, Jacob R, Sasidharan S. Effects of COVID-19 lockdown on type 2 diabetes, lifestyle and psychosocial health: A hospital-based cross-sectional survey from South India. Diabetes Metab Syndr 2020;14(6):1815-9. [CrossRef]

18. Alshareef R, Zahrani AA, Alzahrani A, Ghandoura L. Impact of the COVID-19 lockdown on diabetes patients in Jeddah, Saudi Arabia. Diabetes Metab Syndr 2020;14(5):1583-7. [CrossRef]
19. Shimels T, Kassu RA, Bogale G, Bekele M, Getnet M, Getachew A, et al. Magnitude and associated factors of poor medication adherence among diabetic and hypertensive patients visiting public health facilities in Ethiopia during the COVID-19 pandemic. PLoS One 2021;16(4):e0249222 [CrossRef]
20. Yavuz DG, Ozcan S, Deyneli O. Adherence to insulin treatment in insulin-naïve type 2 diabetic patients initiated on different insulin regimens. Patient Prefer Adherence 2015;9:1225-31. [CrossRef]
21. Peeters B, Tongelen IV, Duran Z, Yüksel G, Mehuys E, Willems S, et al. Understanding medication adherence among patients of Turkish descent with type 2 diabetes: a qualitative study. Ethn Health 2015;20(1):87-105. [CrossRef]
22. Ozder A, Sekeroglu M, Eker HH. Quality of life and satisfaction with treatment in subjects with type 2 diabetes: results from primary health care in Turkey. Int J Clin Exp Med 2014;7(12):5715-22.
23. Önmez A, Gamsızkan Z, Özdemir Ş, Kesikbaş E¸ Gökosmanoğlu F, Torun S. The effect of COVID-19 lockdown on glycemic control in patients with type 2 diabetes mellitus in Turkey. Diabetes Metab Syndr 2020;14(6):1963-6. [CrossRef]
24. Tiktin M, Celik S, Berard L.Understanding adherence to medications in type 2 diabetes care and clinical trials to overcome barriers: a narrative review. Curr Med Res Opin 2016;32(2):277-87. [CrossRef]
25. Trabelsi K, Ammar A, Masmoudi L, Boukhris O, Chtourou H, Bouaziz B, et al. Sleep quality and physical activity as predictors of mental wellbeing variance in older adults during COVID-19 lockdown: ECLB COVID-19 International Online Survey. Int J Environ Res Public Health 2021;18(8):4329. [CrossRef]
26. Gautam V, Dileepan S, Rustagi N, Mittal A, Patel M, Shafi S, et al. Health literacy, preventive COVID 19 behaviour and adherence to chronic disease treatment during lockdown among patients registered at primary health facility in urban Jodhpur, Rajasthan. Diabetes Metab Syndr 2021;15(1):205-11. [CrossRef]