



## Research Article

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# EVALUATION OF MEDICATION ADHERENCE OF INDIVIDUALS WITH CHRONIC DISEASES DURING RAMADAN

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## Abstract

**Objectives:** Our study aimed to evaluate the adherence of individuals with chronic diseases who need to take regular medication during Ramadan.

**Materials and Methods:** A total of 152 fasting individuals over 18 years with at least one chronic disease who visited Ankara City Hospital Family Medicine Outpatient Clinic for any reason within one month between April and May 2023 during Ramadan were included. A unique structured questionnaire form and the MMS (Modified Morisky Scale-Turkish version) measuring medication adherence were used in the study.

**Results:** Among the participants of the study, 55.92% of the patients were female, 89.47% of the patients were married, and 61.18% were unemployed. 38.16% of the patients were elementary school graduates. The most common chronic diseases were found as hypertension at 54.95%, diabetes at 38.16%, and hypothyroidism at 17.11%. The rate of disruption in medication compliance was statistically higher among employed patients ( $p=0.040$ ). It was observed that elementary school graduates were significantly more compliant in medication use than graduates with higher education levels ( $p=0.005$ ;  $p=0.031$ ). 67.11% of the patients stated that they "always" used their medications regularly.

**Conclusion:** Medication use was found to be affected by many factors in patients with chronic diseases who should take medication regularly. There was a change in the time of taking medication during Ramadan. Most of the patients were found to have high motivation and a high level of knowledge, according to the MMS. Patients' medication compliance increased with increasing age. In light of these findings, proactive assessment by primary care physicians prior to the start of Ramadan may play a pivotal role in improving medication and treatment adherence among affected patients.

**Keywords:** Medication compliance, chronic diseases, family medicine, Ramadan.

## Introduction

During Ramadan, many Muslims around the world, including our country, observe daily fasting from dawn until dusk. This fasting practice entails refraining from eating and drinking during these periods. The duration of fasting varies, ranging from 10 to 18 hours, depending on the season and geographical location.<sup>1</sup> Some individuals who wish to fast as a religious obligation may also have chronic diseases or illnesses that necessitate regular treatment. In such cases, adjusting the timing of medication becomes imperative. While maintaining consistent medication compliance under medical supervision is crucial, healthcare professionals should ensure that such adjustments respect the individual's autonomy. Physicians should employ relevant resources to facilitate optimal treatment modifications during Ramadan.<sup>2</sup>

It is important for patients to have the ability to adhere to their medication regimen while fulfilling their religious obligations. The primary goal of medication management is to achieve maximum effectiveness. The patient's attitudes and behaviors significantly impact the management of medication use. Hence, assessing patients' adherence to treatment during Ramadan becomes vital. Our intended study aims to evaluate the adherence of individuals with chronic diseases to their treatment regimens during Ramadan. These patients, who opt to fast during Ramadan, often need to modify their medication schedules accordingly. Developing a tailored treatment plan specific to Ramadan is essential to safeguard patients' health status. Our study is anticipated to contribute to the successful alignment of individuals with chronic diseases with their treatment plans during Ramadan. By doing so, we will further enhance secondary and tertiary preventive healthcare services, aligning with our core competency in comprehensive patient care within the field of family medicine.<sup>3</sup> Furthermore, our efforts will ensure the uninterrupted continuation of patients' ongoing treatments, thus preventing the exacerbation of their medical conditions.

## Materials and Methods

Our study is a cross-sectional observational study. It encompasses a sample of 152 individuals who visited Ankara City Hospital Family Medicine Outpatient Clinic for any reason during the period from April 6, 2023, to May 6, 2023. To be eligible for inclusion, participants needed to be over 18 years old, have at least one chronic disease and observe fasting during Ramadan. A unique structured questionnaire form and the MMS (Modified Morisky Scale Turkish version) were used.<sup>4</sup>

### *Data Collection Tools and Evaluation*

In our study, a questionnaire form and the MMS were used to collect information about the patient's age, gender, educational status, smoking status, height, weight, monthly income, employment status, chronic

diseases, medications used, regular use of medications, disruption in medication use, getting up for Suhoor and medication use during Ramadan. This scale consists of six questions. The questions are answered as yes/no. The data collection questionnaire of our study was completed by the responsible researcher in the Family Medicine Outpatient Clinic of Ankara Bilkent City Hospital by face-to-face questionnaire administration method.

In the Modified Morisky Scale, the questions will be answered as Yes/No and in the evaluation, in questions 2 and 5, yes is 1 point, no is 0 points; in the other questions, yes is 0 points, no is 1 point. The total score obtained by the patient from the 1st, second and sixth questions gives the Morisky motivation score, while a total score of 0 or 1 indicates a low motivation level, and >1 indicates a high motivation level. The total score obtained from questions 3, 4 and 5 gives the Morisky knowledge score, whereas a total score of 0 or 1 indicates a low level of knowledge and >1 indicates a high level of knowledge.<sup>5</sup>

#### *Statistical Analysis*

All data were combined in a common database, and statistical analysis was performed with the SPSS 25.0 program. Descriptive statistical data were expressed as mean  $\pm$  standard deviation for continuous variables, number and % for discrete data. The conformity of continuous variables to normal distribution was evaluated by examining histogram graphs and interpreting Kolmogorov Smirnov and Shapiro-Wilk tests. The independent T-test was used to determine whether there was a statistically significant relationship between the two independent groups. Correlation analysis was performed to determine whether there is a relationship between two or more variables and, if so, its strength and direction. The chi-square test was used to compare qualitative data between and within groups. Differences between groups were accepted as significant at  $p < 0.05$  with a reliability interval of 95%.

## **Results**

In our study, 152 fasting individuals aged 18 years and older with at least one chronic disease visited Ankara City Hospital Family Medicine Outpatient Clinic for any reason within one month between April 6, 2023, and May 6, 2023, during Ramadan. Among the patients, 55.92% (n=85) were female, and 44.08% (n=67) were male. 89.47% (n=136) were married, and 10.53% (n=16) were single. The mean age was  $57.28 \pm 13.08$  years (25-85 years), the mean height was  $165.32 \pm 9.30$ , and the mean weight was  $78.39 \pm 15.16$ . Body mass index was mostly overweight. 61.18% (n=93) of the patients were unemployed, and 38.82% (n=59) were working. 38.16% (n=58) were elementary school graduates, and 34.87% were university/high school graduates. The sociodemographic findings of the patients are shown in Table 1.



**Table 1.** Variables showing the sociodemographic characteristics of the patients

Descriptive variables (n=152)		n	%	
Gender	Male	67	44.08	
	Female	85	55.92	
Marital status	Married	136	89.47	
	Single	16	10.53	
Education status	Illiterate	11	7.23	
	Elementary education	58	38.16	
	High School	30	19.74	
	University/College	53	34.87	
Employment status	Not working	93	61.18	
	Working	59	38.82	
Income status	Bad	9	5.92	
	Middle	105	69.08	
	Good	38	25.00	
Cigarette	I quit	31	20.39	
	None	97	63.82	
	Yes	24	15.79	
BMI	Normal	37	24.34	
	Overweight	61	40.13	
	Obese	54	35.53	
Chronic disease groups (n=278)*	Cardiovascular diseases	106	69.74	
	Endocrine system diseases	106	69.74	
	Lung diseases	20	13.16	
	Rheumatic diseases	8	5.26	
	GI diseases	7	4.61	
	Mental illness	6	3.95	
	Neurological diseases	6	3.95	
	Other	19	12.50	
	The most common chronic diseases	Hypertension	82	53.95
		Diabetes Mellitus	58	38.16
Hypothyroidism		26	17.11	
Dyslipidemia		20	13.16	
Asthma, COPD		19	12.50	
Heart failure	10	6.58		

\*More than one disease is marked. BMI: Body Mass Index; COPD: Chronic Obstructive Pulmonary Disease

There was no statistical difference between gender and experiencing interruptions in medication use ( $p=0.913$ ). There was no statistical difference between marital status and experiencing interruptions in medication use ( $p=0.183$ ). The rate of interruption in medication use was statistically lower in those with lower educational status. The rate of interruption in medication use was statistically higher in employees ( $p=0.040$ ). No significant difference was found between income status and disruption in medication use ( $p=0.869$ ). Table 2 shows the comparison of patients' sociodemographic information with disruption in medication use.

It was found that the patients had been taking medication for an average of  $10.74 \pm 8.14$  years. Patients' attitudes towards medication use during Ramadan are shown in detail in Table 3. While 59.21% (n=90) of the participants stated that they experienced interruptions in medication use, the most common interruptions were travel 54.44% (n=49), Ramadan 23.33% (n=21), vacation 8.88% (n=8) and weekends 6.67% (n=6).

**Table 2.** Comparison of descriptive data with disruption in patients' medication compliance

Comparison			Disruption in medication compliance		p*
			No	Yes	
Education status	Elementary School	n	37	32	<b>0.005</b>
		%	37.38	32.32	
	High School	n	7	23	<b>0.031</b>
		%	7.07	23.23	
	Elementary School	n	37	32	0.311
		%	30.33	26.23	
University/College	n	18	35	0.311	
	%	14.75	28.69		
High School	n	7	23	0.040	
	%	8.43	27.71		
University/College	n	18	35	0.040	
	%	21.69	42.17		
Employment status	Not working	n	44	49	<b>0.040</b>
		%	28.95	32.24	
	Working	n	18	41	
		%	11.84	26.97	

\*Pearson Chi-Square Test

The relationship between the participants' descriptive data on medication use and disruption in medication use was examined, and no significant relationship was found (Table 4). A similar relationship was found between the diagnosis of the patients and regular medication use ( $p=0.668$ ). The relationship between experiencing disruption in medication compliance and motivation and knowledge level according to the Modified Morisky Scale is shown in Table 5.

According to the Modified Morisky Scale, 69.74% (n=106) of the patients included in the study had high motivation, and 88.82% (n=135) had high knowledge (Figure 1). The correlation analysis between sociodemographic findings and Morisky Motivation and Knowledge Scores in our study is shown in Table 6.

**Table 3.** Patients' attitudes towards medication use during Ramadan

Parameters		n	%
<b>How many different medicines do you take during the day?</b>	1	<b>45</b>	<b>29.60</b>
	2	42	27.63
	3	25	16.45
	4	11	7.24
	5 and above	29	19.08
<b>Do you take the medicines prescribed for your illness regularly?</b>	Always	<b>102</b>	<b>67.11</b>
	Usually	40	26.32
	Occasionally	8	5.26
	Rarely	1	0.66
	Never ever	1	0.66
<b>Do you ever forget a dose?</b>	Never ever	38	25.00
	Rarely	<b>60</b>	<b>39.47</b>
	Occasionally	46	30.27
	Usually	8	5.26
<b>If you forget a dose, when do you take it?</b>	I don't forget	36	23.69
	I take it when I remember	<b>70</b>	<b>46.05</b>
	I don't take any	46	30.26
<b>Does anyone remind you to take your medication?</b>	Yes	37	24.34
	No	<b>115</b>	<b>75.66</b>
<b>Do you carry your medicines with you?</b>	Always	<b>101</b>	<b>66.45</b>
	Usually	14	9.21
	Occasionally	4	2.63
	Rarely	7	4.60
	Never ever	26	17.11
<b>In which cases do you experience interruptions in your medication?</b>	Never ever	<b>62</b>	<b>40.79</b>
	When I travel	49	32.23
	On weekends	6	3.95
	During Ramadan	21	13.82
	During vacation periods	8	5.26
	Other	6	3.95
<b>Do you wake up for Suhoor?</b>	Always	<b>115</b>	<b>75.66</b>
	Usually	9	5.92
	Occasionally	3	1.97
	Rarely	1	0.66
	Never ever	24	15.79
<b>How does the way you take your medication change during Ramadan?</b>	No change	23	15.13
	I take it all at Iftar	19	12.50
	I take it all at Suhoor.	24	15.79
	I divide it between Iftar and Suhoor	<b>84</b>	<b>55.26</b>
	I never use it	2	1.32

(The highest volumes are shown in bold.)

**Table 4.** Descriptive Data on Medication Use and Disruption in Medication Compliance

		n	Average	SD	p*
How many diseases do you have for which you take medication all the time?	No	62	1.90	1.04	0.325
	Yes	90	1.74	0.93	
How many years have you been taking medication continuously?	No	62	11.68	8.93	0.242
	Yes	90	10.10	7.54	
How many different medicines do you take during the day?	No	62	2.82	2.01	0.832
	Yes	90	2.76	1.83	

\* Independent Samples T Test

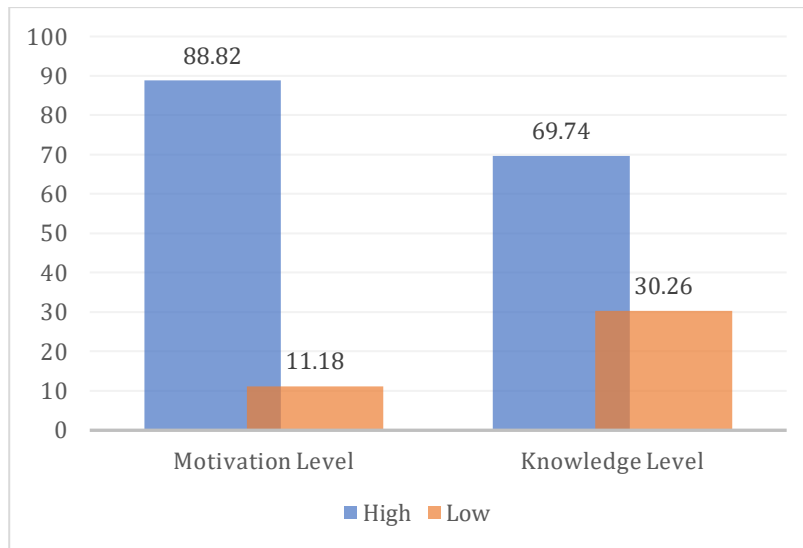
**Table 5.** The Relationship Between Experiencing Disruption in Medication Compliance and Motivation and Knowledge Level According to the Modified Morisky Scale

Modified Morisky Scale		Experiencing interruptions in medication use		Total	p
		No	Yes		
Morisky motivation points	Low motivation	7 (4.61%)	39 (25.66%)	46 (30.26%)	<b>&lt;0.001</b>
	High motivation	55 (36.18%)	51 (33.55%)	106 (69.74)	
	Total	62 (40.79%)	90 (59.21%)	152 (100.0%)	
Morisky knowledge score	Low knowledge	3 (1.97%)	14 (9.21%)	17 (11.18%)	<b>0.039</b>
	High knowledge	59 (38.82%)	76 (50.00%)	135 (88.82%)	
	Total	62 (40.79%)	90 (59.21%)	152 (100.0%)	

**Table 6.** Correlation of Morisky Motivation and Knowledge Score with Sociodemographic Results

		Age (years)	Total monthly income level	Motivation Score	Knowledge Score
Age (years)	Pearson Correlation	1	0.026	0.217*	0.022
	Sig. (2-tailed)		0.754	0.007	0.792
	N	152	8152	152	152
Total monthly income level	Pearson Correlation	0.026	1	0.097	0.272*
	Sig. (2-tailed)	0.754		0.236	0.001
	N	152	152	152	152
Motivation Score	Pearson Correlation	0.217*	0.097	1	0.364*
	Sig. (2-tailed)	0.007	0.236		0.000
	N	152	152	152	152
Knowledge Level Score	Pearson Correlation	0.022	0.272*	0.364*	1
	Sig. (2-tailed)	0.792	0.001	0.000	
	N	152	152	152	152





**Figure 1.** Patients' Motivation and Knowledge Levels According to the Modified Morisky Scale

## Discussion

During Ramadan, many Muslims fast from dawn until sunset. Depending on where they live, the duration of the fast varies between 10 and 18 hours. This is very important for patients with chronic diseases who need to take regular medication. Patients who want to fast may need to change their medication times under the supervision of a doctor. When this change is made, it is important that patients comply with the treatment so that the treatment is not interrupted. Patients' compliance with treatment is affected by many factors.

In our study, it was determined that there was a significant difference between the educational status of the participants and medication compliance. When the difference between the groups was examined, it was found that elementary school graduates did not experience significant disruption in medication compliance compared to both high school graduates and university/college graduates. In contrast to our study, in a thesis study, it was found that elementary school graduates had significantly lower regular medication use than both high school and university graduates.<sup>5</sup> In a study by Yakar et al., 54.3% of illiterate participants showed low compliance with antihypertensive treatment.<sup>6</sup> In a study by Demirbaş et al., the medication compliance score was higher in those with primary education and above compared to those who were only literate.<sup>7</sup> According to the literature, it can be said that medication compliance increases with increasing education levels. In our study, the result that medications were used more regularly in elementary school graduates compared to high school and university graduates may be attributed to the fact that the patients in our study were mostly primary

school graduates. In addition, as a result of the fact that fasting acclimatizes individuals to a certain amount of physical exercise and makes individuals more compliant in terms of medication use, it may have emerged as a positive reflection of fasting in our participant group, the majority of whom were elementary school graduates.<sup>8</sup>

In our study, a significant difference was found between the participants' employment status and medication use. There was no interruption in medication use, significantly more in those who were not working. Similarly, in a study by Lee et al., patients who were not working or retired used their medications more regularly.<sup>9</sup> According to the study by Kang et al., working patients were less compliant with their medications.<sup>10</sup> According to our study and the literature, employment status affects medication adherence. While non-working individuals use their medications more regularly, it can be said that the opposite situation in working individuals is due to the intense pace of working life.

Our study was conducted on patients who were fasting during Ramadan; 67.11% of the patients "always" and 26.32% "usually" took their medications regularly. In our study, 54.44% of patients who could not take their medications regularly stated that they experienced interruptions in medication use when traveling, 23.33% during Ramadan, and 8.88% during vacation periods. In a thesis study conducted during Ramadan, 71.3% of the participants were found to take their medications regularly. In this study, the regular medication use of the participants was analyzed according to their fasting status, but it was found that there was no statistically significant difference. In addition, 64.3% of the participants who were fasting stated that they used their medication regularly, while the participants experienced disruption in the use of medication during feast, Ramadan, vacation and travel, respectively.<sup>5</sup> When we look at our study and the thesis study, it can be said that Ramadan does not affect regular medication use very much, although many factors affecting regular medication use are seen.

In our study, 55.26% of the patients took their medications between Iftar and Suhoor, 15.79% at Suhoor and only 15.13% stated that the time of medication intake did not change. In a study conducted in Sudan, almost all of the participants took their medications at night between Iftar and Suhoor.<sup>11</sup> In a thesis study, 33.3% of patients took some of their medication at Iftar and some at Suhoor.<sup>5</sup> In a study conducted by Aydın et al., it was found that the majority of asthma patients used their inhaled medications, which should be used regularly, during iftar and Suhoor hours during Ramadan, and in the same study, it was observed that the majority of patients with Chronic Obstructive Pulmonary Disease stopped using their medications during Ramadan.<sup>12</sup> In another study, it was found that the common practice in the use of medication during Ramadan was to take a single dose a day or two doses between Iftar and Suhoor.<sup>1</sup> In a study conducted by Pehlivan et al. during Ramadan, 52.9% of the patients continued to use their medications without any change, while 73.3% did not use them at all.<sup>13</sup> Considering our study and the literature, it is seen that individuals with chronic diseases need to take medication regularly and fast. However, it is understood that patients change their medication times

during Ramadan. It is important for patients to change their medication times under the control of a doctor for their health. It is recommended that patients should apply to their family physician 4-6 weeks before Ramadan in order to fast properly during Ramadan.<sup>14</sup>

In our study, the relationship between the number of diseases, the number of medications used continuously, the duration of medication use and the disruption in medication use during Ramadan was examined, and no significant relationship was found. In a study conducted by Demirbaş et al., the relationship between the duration of the disease diagnosis, the number of medications used by the patients and the total score of the drug therapy compliance scale was examined, a significant relationship was found, and it was observed that the compliance scale score decreased with the increase in the duration of diagnosis and the number of medications used.<sup>7</sup> In a thesis study, it was found that there was a statistically significant difference in the regular use of medication according to the number of different medications used by the participants, and the rate of regular use of medication was higher in those who used 1-2 medications daily than in those who used five or more medications daily.<sup>5</sup> In the study by Jankowska-Polańska et al., it was observed that people who were prescribed monotherapy or single-tablet polytherapy used their medication more regularly than those taking more than one medication.<sup>15</sup> In the study by Teshome et al., people taking less than two antihypertensive drugs per day had more regular medication use than those taking two or more drugs.<sup>16</sup> There was a difference between our study and other studies in the literature. According to studies in the literature, patients' medication adherence decreased with increasing number of medications used. The different results in our study may have been due to the fact that our study was conducted on fasting patients during Ramadan.

In our study, 69.74% of the patients had high motivation, and 88.82% had a high knowledge level, according to the MMS. In our study, a significant correlation was found between the MMP (Morisky Motivation Point) and MKP (Morisky Knowledge Point) and the opinion of not experiencing a disruption in medication use during Ramadan. It was understood that those who experienced disruption in medication use had significantly low motivation and low knowledge scores. If the patient's motivation and knowledge level are high, they experience fewer interruptions in medication use even if the time of medication use changes during Ramadan; this may be explained by the fact that informing and motivating patients about their treatment contributes to the regular use of medications.

In our study, there was a significant weak positive correlation between age and MMP. In a study by Kara et al., it was found that the mean MMP scores tended to increase with increasing age, but the relationship was not statistically significant.<sup>17</sup> In a meta-analysis of international publications, 15 studies showed that medication adherence increased with age.<sup>18</sup> This result may be attributed to the patient's acceptance of their disease over time and regular visits to their follow-up visits. Two different studies in the literature showed that medication adherence decreased with increasing age.<sup>19,20</sup> In a study conducted by Yakar and colleagues, it was found that

the compliance of participants aged 65 years and older with antihypertensive treatment was statistically significantly lower than that of individuals under 65 years of age.<sup>6</sup> This may be related to the decrease in functional and mental capacity due to old age or the increased likelihood of diseases such as dementia and Alzheimer's disease, which may cause cognitive impairment with age.

### *Conclusions*

In our study, medication use was found to be affected by many factors in patients with chronic diseases who should take medication regularly. It was found that there were more disruptions in medication use in people who are working. It was found that those with elementary education used their medications more regularly. It was found that patients experienced disruptions in medication use when traveling, during Ramadan and during vacation periods, respectively. It was observed that there was a change in the time of taking medication during Ramadan. Most of the patients were found to have high motivation and a high level of knowledge, according to the MMS. It was observed that medication adherence increased with increasing age.

Compliance with treatment is very important for patients with chronic diseases who need to take medication regularly. It is especially important for patients who will be traveling to visit their family physician before traveling and for patients who will be fasting during Ramadan to visit their family physician before Ramadan. Again, it is necessary for patients to be informed about the diseases they have in order to ensure compliance with treatment. Patients' acceptance of their diseases and their follow-ups will increase their motivation and contribute to more regular use of their medications. These follow-ups need to be revised in every possible change, and Ramadan is one of these periods. It is important for physicians to turn these periods into an opportunity to follow up with their patients.

**Ethical Considerations:** Ethics committee approval dated April 5, 2023, and numbered E1-23-3443, was obtained from the local ethics committee for research authorization.

**Conflict of Interest:** The author declares no conflict of interest.

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