

Adherence to medication and glucose control in diabetic patients in Duhok, Iraq

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Received 17 May 2022 ♦ Accepted 2 July 2022 ♦ Published 21 July 2022

Citation: Allela O, Mohammed Salih H, Haji Ahmed I (2022) Adherence to medication and glucose control in diabetic patients in Duhok, Iraq. *Pharmacia* 69(3): 673–679. <https://doi.org/10.3897/pharmacia.69.e86649>

Abstract

Background: Diabetes mellitus is a chronic, progressive disorder that causes a variety of health problems. Adherence to medication is a major factor in the treatment outcome. The goal of this study is to translate and test the psychometric features of the Kurdish version of the Morisky Medication Adherence Scale (MMAS-8) among type 2 diabetic patients.

Methods: The research used a cross-sectional approach. The researchers looked at a convenient sample of diabetic Kurdish individuals. MMAS-8 was translated into Kurdish using a normal “forward–backward” technique. It was then tested on 307 type 2 diabetic outpatients in a convenience sample. Internal consistency was checked for reliability. Convergent and known group validity were used to confirm validity. For the authentic statistical analysis, the Statistical Package for Social Sciences (SPSS) version 20 was used.

Results: According to MMAS-8, 20 patients (6.5%) had a high adherence rate, 66 (21.5%) had a medium adherence rate, and 221 (72%) had a low adherence rate. There was no significant link between adherence score and gender ($P = 0.055$), illness duration ($P = 0.251$), or educational level ($P = 0.12$). There was a significant connection between adherence and HBA1C ($P 0.001$).

Conclusion: The results of this validation study show that the Kurdish version of the MMAS-8 is a reliable and valid measure of medication adherence that may now be used. non-adherent. Developing patients’ treatment adherence will improve treatment managements and control.

Keywords

Diabetic patients, Kurdistan, Iraq, Morisky Medication Adherence Scale

1. Introduction

Diabetes was the leading cause of chronic problems, including macro- and micro-vascular (Al-Wahbi 2006). Each year, around 82,000 lower extremity amputations occur in the United States (Rodbard et al. 2007). Over the previous few decades, drug development efforts and research have revealed crucial knowledge that has directly advanced the results in diabetic patients and has extended

the therapeutic process. Furthermore, initiatives to prevent type 1 and 2 diabetes in high-risk populations have been documented (Rodbard et al. 2007).

Diabetes is a significant health problem in Iraq’s Kurdistan area, with a high prevalence of disability and economic hardship. This increase is due to significant socioeconomic growth, changes in eating habits, and an increase in the proportion of overweight and obese people. A type 2 diabetes patient who does not take their

prescribed prescriptions on a regular basis may have an increase in diabetic complications as a result of poor glycemic control, such as an increase in mortality, morbidity, and the use of health-care facilities. Health state, patient characteristics, economic variables, drugs, and health care personal variables have all been linked to medication adherence (Balkrishnan et al. 2003).

Several studies have found a robust link between greater medication adherence and improved glycemic control (Schechtman et al. 2002; Krapek et al. 2004; Hill-Briggs et al. 2005; Rhee et al. 2005), while others have found a negative or non-significant relationship between medication adherence and glycemic control (Diehl et al. 1987; Wooldrige et al. 1992; Hays et al. 1994; Loke and Jong 2008). Nonetheless, it has been hypothesized that the lack of a link between medication adherence and glycemic control could be due to insufficient medications prescribed by health care providers, a poor link between adherence method and patient self-management, or possibly an ineffective assessment of medication adherence (Johnson 1992; McNabb 1997).

The study's main goals are to translate the MMAS-8 questionnaire into Kurdish, validate the MMAS-8 questionnaire, and assess medication adherence.

2. Methodology

A cross-sectional survey study was chosen, in which data was collected using self-reported and structured questionnaires. The participants were recruited from Sheelan Hospital's Diabetes Outpatient Clinic in Duhok, Iraq's Kurdistan region.

Patients with diabetes who had been treated for at least six months before to enrollment in the research were eligible, as were new HbA1c readings that were no more than three months old. This study did not include pregnant women or patients with gestational diabetes.

From July 1st to December 31st, 2016, a convenience sample of (total = 307) diabetic outpatients was identified.

An analytical questionnaire was used to collect data for the study's validation, which included: (1) patients' socio-demographic data with diabetes-related data, including HbA1C levels which measure in Sheelan laboratory in hospital; and (2) the MMAS-8 (Morisky et al. 2008; Krousel-Wood et al. 2009; Morisky and DiMatteo 2011). Furthermore, three parameters were classified to measure patient adherence to their medication according to Morisky (Morisky 2008): patients with MMAS scores = 8 were regarded to have high medication adherence; patients with MMAS scores between 6 and 8 were regarded to have moderate medication adherence; and patients with M Professor Morisky accepted and licensed the translation of MMAS' original English questionnaire into Kurdish.

The three sections of the data collecting sheet were jointly translated according to international norms "forward-backward" technique (Guillemin et al. 1993; Wild et al. 2005) like this:

1. To create a version that was semantically and conceptually as near to the original questionnaire as feasible, a forward translation of the original questionnaire was made from English to Kurdish. Two qualified independent linguists who were both native Kurdish speakers and fluent in English worked on the translation. Without consulting one another, each translator prepared a forward translation of the original questionnaire into the intended language. The two primary versions were examined and contrasted with the original by one of the Kurdish researchers.
2. Following lengthy discussions between the translators and the Kurdish scholars, a reverse translation from Kurdish to English was completed by a different translator. A final version that was ready for testing was created after disagreements were settled at a consensus meeting.
3. The reliability and validity study was able to use the finished, final form of the Kurdish questionnaire. It takes roughly 10–12 minutes to complete the questionnaire. The questionnaire was translated into Kurdish by two multilingual Kurdish instructors at College of Languages, Literacy, and Translations, using a double translation procedure to ensure optimum efficiency in the translation and avoid misunderstanding (Del and Walop 1987).

MMAS consist of 8 items, with a dichotomous response (yes/no) for items 1 to 7, and a 5-point Likert-scale response for the last item. Scoring methods were as recommended (Morisky et al. 2008). Specifically: for items 1–4, 6, 7, one point was given for each item if the answer was 'no'; for item number 5, one point was given if the answer was 'yes'; for item 8, in which a 5-point Likert-scale was used, 'never/rarely'=1, 'once in a while'=0.75, 'sometimes' = 0.5, 'usually' = 0.25, and 'all the time' = 0.0. Total scores ranged from 0 to 8, with a higher score indicative of better medication adherence. The total score reported for each patient corresponds to the summation of the scores for each item.

Finally, data was collected using two versions of the questionnaire (one in Kurdish and the other in English). Cronbach's alpha was used to examine internal consistency and adjusted item-total correlations in order to verify dependability. The test-retest reliability scores and known-groups validity (Al-lela et al. 2011, 2014) were determined using Spearman's rank correlation coefficient (Ratray and Jones 2007).

Finally, the data gathered through face-to-face interviews was thoroughly evaluated to ensure its accuracy. SPSS for Windows (Statistical Package for Social Science) version 20.0 was used to analyze the data, and the level of statistical significance was set at $p < 0.05$ for all analyses.

3. Results

The Adherence scores had a mean standard deviation of 7.02 ± 1.82 . For the 8 items in the Adherence questionnaire,

Cronbach’s alpha test of internal consistency was 0.784. (Table 1).

The validity of known-groups was employed. The Spearman’s rho correlation test revealed a significant negative connection (-0.319; p = 0.025) between Adherence and HBA1C values.

Table 1. Cronbach alpha and descriptive statistics.

Parameter	Cronbach alpha	Mean	Standard Deviation	Minimum	Maximum
Adherence	0.784	7.02	1.82	0	8

- Cronbach’s alpha test of internal consistency.

The results of this study suggest that the average age of the patients was 51.17 ±14.53 years. Patients weighed an average of 76.21±15.86 pounds. Male diabetic patients accounted for 104 (33.9%) and female diabetic patients accounted for 203 (66.1%), respectively (Table 2).

Table 2. Demographic characteristics.

Variable	Frequency	Percent
Gender		
Male	104	33.9
Female	203	66.1
Family History		
Negative	89	29
Positive	218	71
Marital Status		
Single	30	9.8
Married	277	90.2
Educational Level		
None	136	44.3
Primary School	102	33.2
Secondary School	52	16.9
College	17	5.5
Total	307	100

The HbA1C score ranged from 5 to 15, with an average of 8.77±1.77. The majority of patients (37.8%) had diabetes for more than 10 years, while 37.1 percent had diabetes for less than 5 years and 25.1 percent had diabetes between 5–10 years. The majority of patients (88.3%) had diabetic HBA1C (HBA1C > 6.5) and only 3.6 percent had regulated HBA1C (HBA1C 6) levels (Oral medicine was used by the majority of the 221 patients (72%)) (Table 3).

The mean level of adherence was 4.901.65, with a range of zero to eight, and a median of 5.75. In this study, we discovered that the majority of patients (186/60.6%) reduced or stopped their medication without contacting a doctor, whereas 121 patients (39.4%) did not change their medicine (question 3). The majority of patients (78.8%) did not take their medicine the day before they went to the outpatient diabetic clinic, while only 21.2 percent did (question 5). The majority of patients (73.9%) did not want to take their medication every day, while just 26.1 percent of patients wanted to take it every day (question 7) (Table 4).

The adherence score was divided into three categories: low, medium, and high (Table 5). According to the

Table 3. Diabetes related data.

Variable	Frequency	Percent
Diabetes Mellitus Duration		
0–5	114	37.1
5–10	77	25.1
>10	116	37.8
HBA1C Group		
Control	11	3.6
Pre-diabetic	25	8.1
Diabetic	271	88.3
Complications		
None	86	28
Retinopathy	30	9.8
Neuropathy	69	22.5
Nephropathy	1	0.3
Retinopathy+Neuropathy	104	33.9
Retinopathy+Nephropathy	1	0.3
Neuropathy+Nephropathy	4	1.3
All	12	3.9
Medication Type		
Oral	221	72
Injection	37	12
Combined	49	16

Table 4. Medication adherence questionnaire¹.

Variable	Frequency	Percent
Question 1		
Yes	105	34.2
No	202	65.8
Question 2		
Yes	130	42.3
No	177	57.7
Question 3		
Yes	121	39.4
No	186	60.6
Question 4		
Yes		
No	85222	27.772.3
Question 5		
Yes	65	21.2
No	242	78.8
Question 6		
Yes	97	31.6
No	210	68.4
Question 7		
Yes	227	73.9
No	80	26.1
Question 8		
Never	24	7.8
Rarely	45	14.7
Once in a while	81	26.4
Sometimes	85	27.7
Usually	72	23.5

¹Use of the MMAS is protected by US and International copyright laws. Permission for use is required. A license agreement is available from: Donald E. Morisky, MMAS Research (MORISKY), 294 Lindura Court, Las Vegas, NV 89138-4632 dmorisky@gmail.com.

measurements utilized, just 6.5 percent of the patients had a high level of adherence to their medicine.

The Chi-square test was used to investigate the relationship between medication adherence and the HBA1C

Table 5. Medication adherence assessment.

Adherence Class	Variable	Frequency	Percent
Low		221	72
Medium		66	21.5
High		20	6.5

Table 6. Association between HbA1C group and adherence class.

HbA1C Group	Class	Class			Total	P Value
		Low	Medium	High		
Control	Frequency	1	3	7	11	<0.001*
	Percent	9.1	27.3	63.6	100	
Pre-diabetic	Frequency	2	12	11	25	
	Percent	8	48	44	100	
Diabetic	Frequency	218	51	2	271	
	Percent	80.5	18.8	0.7	100	
Total	Frequency	221	66	20	307	
	Percent	72	21.5	6.5	100	

-Chi-square test; *Significant, P-value < 0.05; - Fisher test for cell < 5.

group characteristics. There was a significant relationship (p 0.05) between adherence levels and HbA1C group, with 80.4 percent of diabetes patients (HbA1C > 6.5) having a low level of adherence (Table 6).

The associations between levels of medication adherence and groupings of demographic factors were examined using the Chi-square test as an example. There was no statistically significant (p > 0.05) link between the three degrees of adherence and demographic factors like as gender, DM date, and educational level (Table 7).

4. Discussion

This was the first study to measure treatment adherence among Iraqi-Kurdish patients using a translated and validated questionnaire tool.

Personal qualities

The patients' average age was 51.17, with the bulk of them being over 45. According to the American Diabetes Association's diabetes statistics, 23.1 percent of adults over the age of 60 have been diagnosed with diabetes (American Diabetes Association Website 2010). The average age of the study participants put them at risk for diabetic complications and a bad prognosis (Sulaiman et al. 2004).

According to preliminary findings, the study participants' average weight was 76.21 pounds. There has been an increase in the prevalence of obesity as a result of urbanization and development, with patients' eating habits and physical activity changing. Obesity is also a major problem in diabetic patients, and losing weight is linked to better glycemic control (Fabricatore and Wadden 2003).

No education (44.3%) and primary education (33.2%) were the most prevalent levels of patient education completed. The large number of patients without a high school diploma is consistent with the socioeconomic conditions that have existed in Iraq's Kurdistan area for decades. The

Table 7. Adherence level and demographic characteristics groups association.

Adherence Class	Gender		Total	P Value
	Male	Female		
Low	64	157	221	0.055
	29	71	100	
Medium	32	34	66	
	48.5	51.5	100	
High	8	12	20	
	40	60	100	
Total	104	203	307	
	33.9	66.1	100	

Adherence Class	DM Date			Total	P Value
	0-5	5-10	>10		
Low	74	58	89	221	0.251
	33.5	26.2	40.3	100	
Medium	29	15	22	66	
	43.9	22.7	33.3	100	
High	11	4	5	20	
	55	20	25	100	
Total	114	77	116	307	
	37.1	25.1	37.8	100	

Adherence Class	Educational Level				Total	P Value
	Non	Primary	Secondary	College		
Low	105	75	31	10	221	0.12
	47.5	33.9	14	4.5	100	
Medium	27	19	15	5	66	
	40.9	28.8	22.7	7.6	100	
High	4	8	6	2	20	
	20	40	30	10	100	
Total	136	102	52	17	307	
	44.3	33.2	16.9	5.5	100	

- Chi-square test; - Fisher test for cell < 5.

percentage of patients with a university education was low in this study. According to the study, 71% of the patients have a positive family history of diabetes.

Information on diabetes

According to the survey, the biggest percentage of patients (37.8%) had been diagnosed with diabetes for more than ten years. The study found that the average HbA1C score was 8.77, with the majority of patients (88.3%) having a score of higher than 6.5 percent. The majority of patients suffered one or more problems, with neuropathy plus retinopathy being the most common in this study (33.9 percent).

Only 12% of the patients in the overall group were on insulin. In other Asian studies, between 7 to 28 percent of type 2 diabetes patients were on insulin (Ismail et al. 2000; Tan and Magarey 2008).

Questionnaire on medication adherence

They are more likely to increase adherence to their prescriptions if they have greater information and understanding about DM and pharmacologic therapy. As a result, healthcare providers should emphasize the importance of adherence to hypoglycemic drug administration time, quantity, and method (Hsaio 1999).

Medication adherence evaluation

Knowledge about the extent of drug adherence is required for effective and proper patient treatment. The validated scale MMAS was used in this study to assess medication adherence in diabetic individuals. The results revealed that 72 percent of patients had poor adherence, with a total MMAS score of less than 6. The results of a recent study on diabetes medication adherence revealed that many patients had low adherence to oral diabetic medication, ranging from 67 percent to 85 percent, with an overall adherence range of 36 percent to 93 percent in patients (Cramer 2004; DiMatteo 2004; Lerman 2005; Rubin 2005). Furthermore, the findings of this study on the rate of low medication adherence were consistent with those of other worldwide trials (Evans et al. 2002; Schectman et al. 2002; Guillausseau 2003; Krapek et al. 2004; Bezie et al. 2006; Lawrence et al. 2006; Hankó et al. 2007). However, little is known about the rate of poor medication adherence among diabetic patients in the Kurdistan-region of Iraq; generally, poor medication adherence was one of the leading causes of poor chronic disease management in the Kurdistan-region of Iraq, and more work is needed to recognize the factors contributing to poor medication adherence in chronic diseases (Rashid 2008).

Association between HbA1C group and adherence class

Medication adherence levels were substantially associated with HbA1C group, according to the HbA1C group and adherence class evaluation. Patients with an HbA1C level more than 6.5 exhibited poor medication adherence, as measured by the MMAS score.

The relationship between adherence and HbA1C group data was investigated. There was a significant ($p < 0.05$) link between adherence levels and HbA1C group, with 80.4 percent of diabetes patients (HbA1C > 6.5) having a low level of adherence.

The outcomes of the study showed that high medication adherence was linked to better glycemic control (lower HbA1C), which was consistent with other studies and assessments. Despite population disparities, the studies found that HbA1C was strongly linked to medication adherence. Previous studies have found a strong link between improved diabetes control and medication adherence (Schectman et al. 2002; Guillausseau 2003; Cramer 2004; Krapek et al. 2004; Hill-Briggs et al. 2005; Rhee et al. 2005; Ho et al. 2006; Lawrence et al. 2006; Rozenfeld et al. 2008). Patients who were more compliant with their medication had better glycemic control, therefore efforts to promote medication adherence are strongly encouraged. The study's key finding is that medication adherence is linked to clinical measures of diabetes management; thus, the known variables for medication adherence made for reasonable intervention targets to promote medication adherence.

Higher medication adherence, as measured by a higher MMAS score, was linked to better glycemic control in

the current study (lower HbA1C). Controlling for demographic and diabetes-related characteristics as well as diabetes knowledge in the final logistic regression analysis had no effect on this finding. Other research has found that maintaining hypoglycemic medication adherence is one of the most important factors in achieving better glycemic control (Control and Group 1993; Group 1998).

Association between HbA1C group and demographic characteristics groups

HbA1C levels were shown to be considerably lower as patients' educational levels increased in the study. HbA1C > 6.5 is found in 47.2 percent of patients with no formal education and 40.6 percent of patients who have had diabetes for more than 10 years. International studies (Golin et al. 1996; Mustaffa et al. 1998; Guillausseau 2003), found a significant link between diabetes control and education level. Other studies, on the other hand, found no link between education level and HbA1C (Harris et al. 1999; Dalewitz et al. 2000; Ismail et al. 2000; Howteerakul et al. 2007).

However, the study found no significant associations between HbA1C and the gender of the patients, which is consistent with other studies (Harris et al. 1999; Ismail et al. 2000; Wong and Rahimah 2004; Hartz et al. 2006; Howteerakul et al. 2007). As a result, this could indicate that diabetes control could be achieved among patients of all genders, and that the study's management plan was recommended to all patients regardless of gender. In conclusion, the patients' educational level and the date (duration) of diabetes mellitus were the two characteristics that were substantially connected with HbA1C group (glycemic control).

Adherence level and demographic characteristics groups association

The relationship between medication adherence and demographic characteristics was investigated in order to identify demographic factors linked to medication adherence. Gender, diabetes date, and education level were found to be unrelated to adherence level; nevertheless, the difference in MMAS total score between demographic groups was investigated. The large difference in MMAS scores between groups was examined in order to determine the most accurate explanation for the relationship.

Overall, non-modifiable and inconsistent predictors of low medication adherence include gender, diabetes date, and educational level (Osterberg and Blaschke 2005). The evidence for a link between medication adherence and diabetes duration is mixed, ranging from a positive relationship (Bezie et al. 2006), negative relationship (Brown et al. 1999; Donnan et al. 2002) to no significant relationship (Hill-Briggs et al. 2005).

Although previous research has found a significant link between educational level and medication adherence (Lerman 2005; Bezie et al. 2006), other research has found no link between educational level and medication

adherence (Hill-Briggs et al. 2005). There may be a link between the patients' high educational backgrounds and their knowledge and awareness of how to stick to their medication; they may appreciate and benefit from the doctor's recommendations in terms of medication focus. Patients' demographic characteristics, such as education level, would be even more strongly linked to self-interest care behavior (Howteerakul et al. 2007).

5. Conclusion

In this study, medication adherence was found to be a predictor of appropriate glycemic control. According to the study, a large percentage of patients do not take their medications as prescribed. The demographic characteristics

(degree of education, diabetic duration, and gender) were not connected with adherence, but they were associated with efficacy, convenience, and overall satisfaction.

A lack of understanding and poor medication adherence is a global problem that may explain why diabetes patients have such poor glycemic control.

6. Recommendations

To better understand medicine adherence behavior in the Iraqi-Kurdish setting, further action is required. Many potential adherence hurdles (social, cultural, economical, and psychiatric), which were not examined in this study, could lead to low glycemic control in addition to their effect on adherence.

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