Prevalence of non-adherence to medications in people with type 2 Diabetes mellitus

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ABSTRACT

Introduction: Diabetes mellitus (DM) is a chronic, non-communicable disease that has an increasing incidence rate over time as well as increasing disease-related deaths. Furthermore, around half of diabetic patients are unaware actually about their disease, and more are not taking their medications.

This study aimed to determine the extent of medication adherence and factors contributing to non-adherence among diabetic patients in Majmaah governance, Saudi Arabia. This is an observational cross-sectional study design conducted among patients with type 2 diabetes. A self- administered questionnaire was distributed among diabetic patients .The questionnaire consisted of socio-demographic data, HbA1c level, duration of DM, family history of DM, DM medications and 12-Item Medication Adherence Scale. 180 patients with diabetes type 2 were involved (71.7% females vs. 28.3% males). The prevalence of patients with uncontrolled HbA1c levels was 25%. Family history of DM constitutes 74.4%. The most preferred route for drug administration was oral (50.6%). High non-adherent to medication was found among 57.8%. The independent significant factor associated with high non-adherence to DM medication was uncontrolled HbA1c while being a female was the independent significant factor for low non-adherent to DM medication. The non-adherent of the diabetic patients regarding anti-diabetes medications was widely prevalent. Female patients tend to be more adherent to DM medication than their male counterparts. This study established the fact that uncontrolled glycated hemoglobin was a detrimental factor in adherence to anti-DM medications. More studies are required to raise the awareness of the diabetic population regarding the importance of medication adherence.

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INTRODUCTION

It is well acknowledged that diabetes is one of the most mentally and behaviorly taxing chronic illnesses due to the need for constant self-monitoring of blood glucose levels, dietary changes, diet, and the regular administration of medicines. One of the greatest threats to public health is that diabetics often fail to take their medication as prescribed. Medication non-adherence is more widespread in developing nations like India, where literacy rates are low and access to medical treatment is limited. There is a need to mitigate the variables that contribute to anti-diabetic medication non-adherence, which is a contentious issue in and of itself.[1,2]

Adherence to medication has been described as "the degree to which a patient really follows the specified interval and dosage of a dosing regimen." Adherence to anti-diabetic drugs is the degree to which an individual's medication usage behavior is congruent with medical guidance, while persistence is the time spent on therapy until they are stopped.[3] Adherence to anti-diabetic medicines has essential roles in increasing quality of life and preventing long-term adverse consequences. Furthermore, it is also a worry that non-adherence to anti-diabetic drugs adds a significant burden to the care of this chronic metabolic condition, which causes a wide range of consequences and outcomes.[4] Suboptimal glycemic control, which is mostly attributable to poor medication adherence, remains one of the biggest obstacles to efficient diabetes care. As a result of subpar care, patients may experience a decline in their quality of life, have more doctor visits, and spend more money on medical bills than necessary (drug costs and medical costs). "raising the efficiency of adherence initiatives may have a considerably bigger influence on the health of the community than any improvement in particular medical treatments," the World Health Organization (WHO) said in 2003.[5] Hospital-based research account for the vast majority of India's literature on medication non-adherence for diabetics, revealing that the problem is widespread and that a variety of behavioral and sociocultural variables contribute

to it. In order to find solutions to the problems that lead to pharmaceutical non-adherence, it is necessary to collect data on the numerous elements that contribute to this problem.[6] The World Health Organization (WHO) estimates that by 2040, 8.5% of the global population would have T2DM (more than 642 million persons with diabetes), up from 4.7% in the 1980s. Globally, the number of adults is projected to increase by as much as 69 percent between 2010 and 2030, with the increase in industrialized nations being closer to 20 percent.[7]

The unfavorable attitudes of loved ones toward their T2DM loved ones (discrimination, social rejection, blame, stigmatize, discouraging patients) contribute to the development of a number of biopsychophysiological diseases.[8] Fear, humiliation, worry, poor self-esteem, guilt, and blame are some of the emotions that may be triggered by these attitudes, and they may even worsen the patient's health. Patients with type 2 diabetes who do not take their medicine as prescribed run the risk of significant complications.[9] Non-adherence factors include, but are not limited to, the following: the high cost of anti-diabetic drugs; the long duration of taking medications; the side effects of anti-diabetic drugs (such as fatigue, nausea, vomiting, psychological problems, and itching); sociocultural factors; substance abuse; a lack of health literacy; a lack of belief in the efficacy of insulin; and a failure to persist. Poorer treatment results, low demographic features (such as young age, lower education, and poverty), and the advancement of illness symptoms and consequences have all been found as predictors of non-adherence in previous research.[10, 11] Several studies have shown that older patients had higher rates of medication adherence, whereas others have found the opposite to be true (that is, those younger patients are more likely to take their prescriptions as prescribed). Also, people with diabetes who experience stigma, depression, eating disorders, or anxiety are more likely to have trouble taking their prescriptions as prescribed because of the psychological impact on adherence.[12] When it comes to diabetics, the inability to successfully lower HbA1C is linked to both treatment-related hurdles and bad feelings. In addition, there is a feedback loop between adherence issues and glycemic control issues, leading to dissatisfaction with therapy. Pill load, medicine expense, pharmaceutical side effects, dose frequency, and dosing regimens are all contributors to non-adherence.[13]

Strict adherence to medicines, food, and lifestyle adjustments may result in optimal glucose control and reduced risk of long-term problems in people with diabetes. This causes problems with keeping blood sugar where it ought to be. The World Health Organization (WHO) projected that worldwide adherence to T2DM drugs was 50%, and further noted that adherence was more likely to be lower in underdeveloped nations due to resource restrictions. This means that the percentage of people with diabetes who do not take their prescribed anti-diabetic medicine consistently ranges from 36% to 93%, which may significantly impact blood sugar levels and lead to issues that negatively impact quality of life. In addition, in developing regions like Africa and Asia, where more than half of T2DM patients have poor glycemic control, the disease has a disproportionately negative impact on daily living.[14, 15]

This study, about antidiabetic medication adherence and glycemic management among patients with type two diabetes

mellitus have been performed. The study done in at Majmaah city, Riyadh region, Saudi Arabia. The questionnaire was distributed among adult patients with type 2 diabetes mellitus in the primary healthcare clinic in Majmaah. additionally, an online survey was sent specifically to patients with type 2 diabetes mellitus through socialmedia. for the duration of the length from 1 January 2016 to 31 December 2016.

The findings provide comfort in light of the rising concern that patients with type 2 diabetes in Saudi Arabia are not taking their treatment as prescribed. It is the responsibility of both clinicians and pharmacists to educate patients on the significance of adherence and the positive effects it may have on patient outcomes. Problem-solving skills that help boost medicine adherence and cut down on stockpile buildup. In individuals with a high burden of concomitant diseases and/or polypharmacy, this is especially noteworthy.

METHODOLOGY

Study Design, Setting, and Participants

This Cross sectional study was conducted at Majmaah region, Riyadh, Saudi Arabia. The questionnaire was distributed among patients with type 2 diabetes mellitus in the primary healthcare clinic in Majmaah. additionally, an online survey was sent specifically to patients with type 2 diabetes mellitus through socialmedia. Study population involving patient who age above 18 years diagnosed with type 2 diabetes mellitus.

Data Collection Methods

A pretested, well-designed and validated questionnaire in the Arabic language was used to collect data for assessing of non-adherence to medications in people with type 2 diabetes mellitus. Questionnaire items included demographic characteristics (gender, age, educational level, Average income, marital status,) and clinical factors (disease duration, knowledge about complication of 2TDM, duration of visit, family history of 2TDM, number, and route of administration medication, level of HbA1c).

Medication adherence was measured using the 12-item Medication Adherence Scale. With approval, we were able to get the validated Arabic translation of the 12-Item Medication Adherence Scale.

The four components of the indicator are patients' compliance with therapy, cooperation with healthcare providers, access to and use of information about treatment, acceptance of treatment, and the treatment's suitability to patients' lifestyles. There are three questions for each dimension, and the Likert scale ranges from 1 (never) to 5 (frequently). One's overall score, which may vary from 0 to 60, is indicative of how well they stick to their prescribed medication.

Ethical Consideration

The ethical approval obtained from the ethical committee from Majmaah University. Informed consent was taken from participants with assurance of confidentiality of all given information.

Statistical Analysis

Descriptive statistics were calculated to present the data using numbers, percentages (%), mean and standard deviation,

whenever appropriate. The level of non-medication adherence was compared with the socio-demographic and other related characteristics of the patients with type 2 diabetes by using Chi-square test. Significant values were then placed in a multivariate regression table to determine the independent significant predictor of non-medication adherence. A p-value of <0.05 (two-sided) was used to indicate statistical significance. All data analyses were performed using the Statistical Packages for Social Sciences (SPSS) version 26 Armonk, NY: IBM Corp.

RESULTS

We surveyed 180 patients with type 2 diabetes. Table 1 described the socio-demographic characteristics of the patients. The most common age group was more than 50 years (30.6%) with the majority being females (71.7%). All patients were Saudis and most of them were married (80.6%). Approximately 40% were university degree holders and 38.9% were earning less than 3,000 SAR per month.

In Table 2, 25% had greater than 6.5% HbA1c, and 22.8% had been diagnosed with diabetes for more than 10 years. A family history of diabetes was found among 74.4%. The prevalence of the patients who have heard about the complication of diabetes was 90%. 61.7% had a regular visit to the doctor. With regards to the route of medication administration, 50.6% were taking it orally and were taking twice

at a time (38.9%). The most common reason for not taking medication was forgetting (79%).

In the assessment of non-adherence to DM medications (**Table 3**), better adherence can be shown in the statement "I personally search for and collect information that I want about my medicine" (mean score: 3.07), followed by the statement "Over the past three weeks, I have followed the instructions about when or how often to take my medication" (mean score: 2.98) and "I sometimes get annoyed that I have to keep taking medicine every day" (mean score: 2.95) while the adherence was poor

Table1: Socio-demographic characteristics of the patients with type 2 diabetes (n=180)

Study variables	N (%)
Age group	
• 18–30 years	35 (19.4%)
• 31–40 years	36 (20.0%)
• 41–50 years	54 (30.0%)
• >50 years	55 (30.6%)
• Gender	
• Male	51 (28.3%)
• Female	129 (71.7%)
• Nationality	
• Saudi	180 (100%)
• Non-Saudi	0
• Marital status	
• Married	145 (80.6%)
• Unmarried	35 (19.4%)
• Educational level	
• Elementary	16 (08.9%)
• Intermediate	18 (10.0%)
• Secondary	74 (41.1%)
• University	72 (40.0%)
• Monthly income (SAR)	
• <3,000	70 (38.9%)
• 3,000–6,000	28 (15.6%)
• 6,001–10,000	36 (20.0%)
• 10,001–15,000	40 (22.2%)
• >15,000	06 (03.3%)

Table 2: Characteristics of the patients with diabetes and their method of treatment (n=180)

Variables	N(%)
• The average of your cumulative blood sugar level (HbA1c)	
• I Don't know	100 (55.6%)
• Lessthan5.7%	20 (11.1%)
• 5.8%-6.5%	15 (08.3%)
• More than 6.5%	45 (25.0%)
• Time when diagnosed with diabetes	
• Less than one year	48 (26.7%)
• 1-3years	45 (25.0%)
• 3-5years	14 (07.8%)
• 5-10years	32 (17.8%)
• More than 10 years	41 (22.8%)
• Family history of diabetes	
• No	46 (25.6%)
• Yes	134 (74.4%)
• Heard about the complication of diabetes	
• No	18 (10.0%)
• Yes	162 (90.0%)
• Frequency of doctor visitation	
• Weekly	06 (03.3%)
• Monthly	111 (61.7%)
• Annually	63 (35.0%)
• Route of drug administration	
• Orally	91 (50.6%)
• Needles	62 (34.4%)
• Both	27 (15.0%)
• Number of medications	
• One	54 (30.0%)
• Two	70 (38.9%)
• Three or more	56 (31.1%)
• If you are not obligated to take medications, please specify the reason? (n=157)	
• Forgetting	124 (79.0%)
• Not convinced of the benefit of treatment	02 (01.3%)
• Unavailability of treatment	07 (04.5%)
• Symptoms caused by treatment	18 (11.5%)
• Laziness	06 (03.8%)

Table 3: Assessment of non-adherence to DM medications [(n=180)]

Statement	Mean±SD	Rank	Rating
1. Over the past three weeks, I have taken the prescribed daily dosage of my medication	2.69 ± 1.50	10	Moderate
2. Over the past three weeks, I have followed the instructions about when or how often to take my medication	2.98 ± 1.47	2	Moderate
3. I have stopped taking medication based on my own judgment (not including times when I forgot to take my medication)	2.16 ± 1.17	12	Low
4. I feel comfortable asking my healthcare provider medication about my medication	2.82 ± 1.18	4	Moderate
5. My healthcare provider understands when I tell him/her about my preferences in medication taking	2.80 ± 1.21	7	Moderate
6. My healthcare provider understands when I explain to him/her about my past medication including previous allergic reactions	2.80 ± 1.22	8	Moderate
7. I understand both the effects and the side effects of my medication	2.82 ± 1.20	5	Moderate
8. I report side effects, allergic reactions, or unusual symptoms caused by the medication	2.81 ± 1.32	6	Moderate
9. I personally search for and collect information that I want about my medicine	3.07 ± 1.29	1	Moderate
10. I accept the necessity of taking the prescribed Medication manner to treat my illness	2.61 ± 1.39	11	Moderate
11. Taking medication is part of my everyday life, just like eating or brushing my teeth	2.70 ± 1.48	9	Moderate
12. I sometimes get annoyed that I have to keep taking medicine every day	2.95 ± 1.42	3	Moderate
Overall score for non-adherence to medication	**2.77 ± 0.88**	**--**	**Moderate**

Response has a ranged from "Never" coded as 1 to "always" coded as 5. A higher mean score indicates better adherence to DM medications.

in the statement related to "I have stopped taking medication based on my own judgment (not including times when I forgot to take my medication)"(meanscore:2.16). The overall mean score of non-adherence to medication was 2.77 (SD0.88).

Figure 1: Prevalence of non-adherence to DM type 2 medication.

When measuring the relationship between the level of non-adherence to DM medication among the socio- demographic
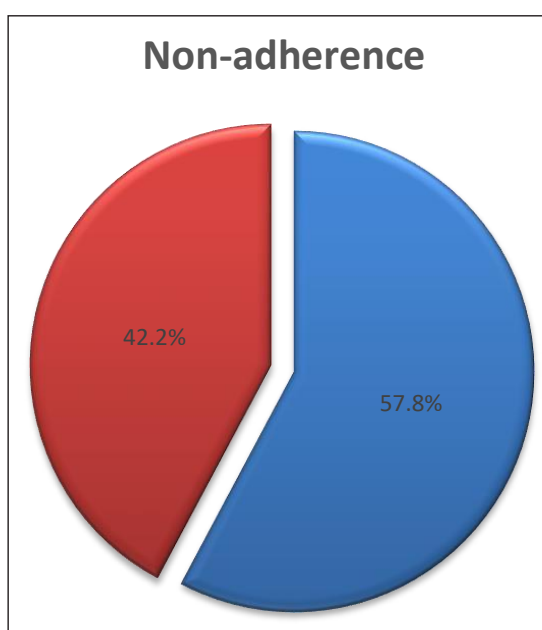

Fig. 1: The prevalence of non-adherence to DM type 2 medication. It can be observed that 57.8% were classified as high non-adherence while the rest was low (42.2%).

characteristics of diabetic type 2 patients, it was found that the prevalence of high non-adherence was significantly more common among gender males ($X2=12.443$; $p<0.001$), those who were earning more than 6,000 SAR per month ($X2=5.335$; $p=0.021$), those with uncontrolled HbA1c level ($X2=28.971$; $p<0.001$), those with 5 years or less since DM diagnosis ($X2=9.785$; $p=0.002$), those with a family history of DM ($X2=13.394$; $p<0.001$), those who have heard about the complication of DM ($X2=5.354$; $p=0.021$) and those who were taking medication orally ($X2=12.644$; $p=0.002$). Other variables included in the test did not show a significant relationship with the level of non-adherence including age group, marital status, educational level, frequency of doctor visitation and number of medications ($p>0.05$) **(Table 4)**.

In a multivariate regression model, it was observed that female gender and uncontrolled HbA1c level (>6.5%) were the independent significant factors of non-adherence to medication. This further indicates that compared to males, the odds of being high non-adherent to medications were likely to decrease in females by at least 95% (AOR=0.026; 95% CI=0.002 – 0.403; $p=0.009$). On the other hand, patients who had uncontrolled HbA1c levels (>6.5%) were predicted to increase the chance of high non-adherent to medication by at least

8.9 times higher than those with controlled HbA1c (≤6.5%) (AOR=8.933; 95%CI=1.198-66.631; $p=0.033$).

Other variables included in the model did not significantly influence non-adherence to medication after adjustment to the regression model including monthly income, the time when diagnosed with diabetes, family history of diabetes, hearing about the complication of DM, and route of drug adminis-tration **(Table 4)**.

Table 4: Relationship between the level of non-adherence to DM Medication according to the socio- demographic characteristics of the patients with type 2 diabetes [n=180]

	Level of non-adherence			
Factor	High N(%) (n=104)	Low N(%) (n=76)	X2	P-value§
• *Age group*				
• ≤40 years	36 (34.6%)	35 (46.1%)	2.405	0.121
• >40years	68 (65.4%)	41 (53.9%)		
• *Gender*				
• Male	40 (38.5%)	11 (14.5%)	12.443	<0.001 **
• Female	64 (61.5%)	65 (85.5%)		
• *Marital status*				
• Married	81 (77.9%)	64 (84.2%)	1.122	0.290
• Unmarried	23 (22.1%)	12 (15.8%)		
• Educational level				
• Secondary or below	65 (62.5%)	43 (56.6%)	0.641	0.423
• University degree	39 (37.5%)	33 (43.4%)		
• *Monthly income (SAR)*				
• ≤6,000	49 (47.1%)	49 (64.5%)	5.335	0.021 **
• >6,000	55 (52.9%)	27 (35.5%)		
• *HbA1cLevel**				
• Controlled (≤6.5%)	06 (14.6%)	29 (74.4%)	28.971	<0.001 **
• Unconrolled (>6.5%)	35 (85.4%)	10 (25.6%)		
• Time when diagnosed with diabetes				
• ≤5 years	72 (69.2%)	35 (46.1%)	9.785	0.002 **
• >5years	32 (30.8%)	41 (53.9%)		
• *Family history of diabetes*				
• No	16 (15.4%)	30 (39.5%)	13.394	<0.001 **
• Yes	88 (84.6%)	46 (60.5%)		
• *Heard about the complication of diabetes*				
• No	15 (14.4%)	03 (03.9%)	5.354	0.021 **
• Yes	89 (85.6%)	73 (96.1%)		
• *Frequency of doctor visitation*				
• Monthly or weekly	73 (70.2%)	44 (57.9%)	2.919	0.088
• Annually	31 (29.8%)	32 (42.1%)		
• Route of drug administration				
• Orally	64 (61.5%)	27 (35.5%)		
• Needles	26 (25.0%)	36 (47.4%)	12.644	0.002 **
• Both	14 (13.5%)	13 (17.1%)		
• *Number of medications*				
• One	33 (31.7%)	21 (27.6%)		
• Two	40 (38.5%)	30 (39.5%)	0.392	0.822
• Three or more	31 (29.8%)	25 (32.9%)		

DISCUSSION

One of the major stumbling blocks in public healthcare is medication non-adherence which significantly contributes to poor clinical outcomes and increased healthcare financial costs. Addressing the issue of medication non-adherence has been one of the top priorities among government, private institutions and patient organizations [16]. However, this issue is still persistent despite efforts being made.

The findings of this study revealed that 57.8% of the population was assumed to have a high level of non- adherent to DM medications while the remaining 42.2% were classified as low non-adherent. This finding is consistent with the study conducted in Majmaah, Saudi Arabia [17]. The study assessed the prevalence of noncompliance to treatment among the diabetic elderly population. According to their reports, a high prevalence of non-compliance with the treatment plan

Table 5: Multivariate regression analysis to determine the effect of high non-adherence to DM medication among the selected socio-demographic characteristics of the patients (n=180)

Factor	AOR	95% CI	P-value
• *Gender*			
• Male	Ref		
• Female	0.026	0.002 – 0.403	0.009 **
• *Monthly income (SAR)*			
• ≤6,000	Ref		
• >6,000	0.371	0.043 – 3.196	0.367
• *HbA1cLevel**			
• Controlled (≤6.5%)	Ref		
• Uncontrolled (>6.5%)	8.933	1.198 – 66.631	0.033 **
• *Time when diagnosed with diabetes*			
• ≤5 years	Ref		
• >5years	0.124	0.014 – 1.067	0.057
• *Family history of diabetes*			
• No	Ref		
• Yes	11.238	0.932 – 135.533	0.057
• *Heard about the complication of diabetes*			
• No	Ref		
• Yes	0.046	0.001 – 3.229	0.156
• Route of drug administration			
• Orally	Ref		
• Needles	0.381	0.014 – 10.170	0.565
• Both	5.256	0.199 – 138.669	0.320

AOR–Adjusted Odds Ratio; CI–Confidence Interval.
*Patients who do not know their HbA1c were excluded from the analysis.
**Significant at p<0.05 level.

was seen among elder patients. Researcher noted that low compliance with medications was directly associated with their attitudes and knowledge of the disease. It is surprising to know that in their reports, they detected that patients with an attitude and those with some knowledge about diabetes were predicted to be more non-compliant with their treatment than those who were without the knowledge or with a positive/ negative attitude toward the chronic disease. Another study conducted in Qassim region, Saudi Arabia,[18] indicated that 54.8% of 290 diabetic patients exhibited low adherence to DM medication which was demonstrated by the diabetic patients visiting General Hospitals in Northern Ethiopia. Contrary to these reports, some papers documented high adherence to DM therapy such as the studies carried out in Jeddah[19] and Riyadh, Saudi Arabia.[20, 21] The poor adherence to DM medication might be stemmed from the lack of education regarding the importance of taking medications on time and a poor understanding of the risk factors of diabetes. In connection with this, our study population indicates that even though most of them had a good understanding of the complication of diabetes, however, only 3.3% of the patients were visiting the diabetic clinic weekly and nearly sixty percent of them did not monitor their blood sugar level.

In our study, male patients exhibited poor adherence to medication than female patients. This result contradicted the findings of Balkhi et al.[21] According to their findings, women with type 2 diabetes were more likely to exhibit poor medication adherence than men. The discrepancy in the report could be due to the difference in sample size, as in our study, we only recruited 180 diabetic type patients while the latter was done in a large tertiary hospital with a total sample size of 5457 diabetic patients.

It has been established in the literature that poor glycemic control is directly related to poor adherence to diabetes medications .[18, 21-25] This is also true in our study as we found that patients with uncontrolled HbA1c demonstrated a high level of non-adherent to anti-DM medications. However, in a study by Balkhi et al.[21] They found no association between glycaemic control and adherence to oral anti-DM medication which was not consistent with previous reports.

Conversely, we noted several variables were seen as having significant relationships with the level of non- adherent, such as monthly income, duration of DM, hearing about DM complications and route of drug administration. However, after performing a multivariate regression analysis, these variables were not predicted as relevant factors of high non-adherence. In a study conducted by Alqarni et al.[22] they found occupational status, current medication, glycated hemoglobin, and the number of associated comorbidities with having significant relationships to the level of adherence, however, after conducting multivariate estimates, patients with no associated comorbidities and an A1c of less than 7 percent remained significant and were identified as the independent significant factors associated with low adherence rate. Patients with

HbA1c levels 6.5% were also predicted to be independently associated with a low non-adherence rate in our study, which was consistent with a previous report.

A survey conducted among diabetic patients in Riyadh, Saudi Arabia [20], revealed that being single has a positive association with low adherence and was the only independent significant factor after performing regression estimates, however, age, educational level, number of medications per prescription were not significantly associated with adherence intention. These findings are almost similar to our results, as we found age group, educational level, and the number of medications did not show a significant relationship with the level of non-adherent to DM medications, however, marital status was also shown insignificant to the level of non-adherent.

Some paper relates poor adherence to behavioral and social factors. For instance, in a mixed-method study published by Aloudah et al.[25] the theoretical framework showed a direct link with oral hypoglycaemic agents (OHAs) including behavioral related factors, social influence, and gaps in knowledge about DM and its management with OHAs while in a study of Alshehri et al.[19] non-adherence was associated with poor outcomes and lower quality of life. In our study, we identified some behavioral factors that contributed to poor adherence to DM medications and the most dominant of them was forgetting to drink the prescribed medicine (79%). Infrequent doctor visitation also played a factor in the lack of adherence, as only 3.3% were visiting a doctor on a weekly basiswhile35%ofthemweredoingitannually. Forgetful was also mentioned as the most common reason for not taking DM medications as reported in the studies of Alshehri et al.,[19] Alqarni et al.[22] and Rabba et al.[23] However, a survey done in AlKhobar, SaudiArabia.[24] assumed medication adherence was influenced by religious and social factors. They reported that 42.5%of thepatients had forgotten to take medicines due to Ramadan festivities. It is important to note that in Islam, the Ramadan fasting obligation is for healthy Muslims only. It could become a challenge among healthcare providers if the patient insisted on fasting. Thus, the guidelines published by the American Diabetes Association (ADA) are vital for managing patients with diabetes during Ramadan which includes education related to disease centering on Ramadan-based management of pharmacotherapy. Awareness campaigns are equally important to educate healthcare providers and patients about ADA recommendations for diabetes management during Ramadan fasting. It is interesting to know more about the impact of behavioral and social factors on the related adherence to DM medication of the diabetic population.

CONCLUSION

The non-adherent of the diabetic patients regarding anti-diabetes medications was widely prevalent. Female patients tend to be more adherent than their male counterparts. This study established the fact that uncontrolled glycated hemoglobin was a detrimental factor in adherence to anti-DM medications. The findings of this study may serve as a signal among policymakers and governmental institutions and other related healthcare institutions that dealt with the use of medicine to evaluate the existing policies toward the reasonable practice of medicines. In addition, healthcare providers should devise educational programs that increase patients' adherence to prescribed medications and minimize the number of medications stipulated for a patient with diabetes. More studies are required to raise the awareness of the diabetic population regarding the importance of medication adherence.

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