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Adherence to chronic medications among type 2 diabetic patients in primary heath care centres: A cross-sectional study

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is one of the fastest-growing health issues worldwide, and its complications contribute significantly to healthcare costs in Saudi Arabia and worldwide. Adherence to medications is a key element in managing T2DM. Therefore, the aim of this research study is to explica techronic medications adherence among patients with T2DM in primary heath care centres the Makkah Region, Saudi Arabia. *Method:* A questionnaire-based cross-sectional study was conducted among patients with T2DM in PHC centres in the Makkah Region, Saudi Arabia from March 2021 to February 2022. Descriptive statistics were used to describe the participants' characteristics, and a chi-square test was used to test the relationships between variables. *Results:* Overall, 234 T2DM patients joined the study, of which 224 completed the study. For all chronic medications being used, (38%) patients were at risk of polypharmacy as they received five or more chronic medications. The chi-square test showed a dependent relationship ($P<0.001$) between management approach and number of all medications (both antidiabetic and chronic medications) used by T2DM patients. Overall, almost half of the patients (52%) showed a low level of medication adherence, (37%) showed medium medication adherence, and only (11%) showed high medication adherence. *Conclusion:* Patient education is essential to improve awareness regarding medication adherence in managing T2DM. Additional research is needed to monitor medication adherence and identify the factors contributing to this problem.

Keywords: Diabetes Mellitus, Medication Adherence, Antidiabetics

1. INTRODUCTION

Type 2 diabetes mellitus (T2DM) is one of the fastest-growing health issues worldwide. It is currently reaching epidemic levels in some countries, with 285 million affected worldwide, and the projection for the year 2030 is 438

million (Al Dawish et al., 2016; Shaw et al., 2010) Saudi Arabia is ranked as 7th (with a total T2DM prevalence of 23.7%) among the top ten countries with the highest prevalence of T2DM (Naeem, 2015). The sedentary lifestyle that people now have contributes to the high prevalence of T2DM, such as a lack of physical exercise, sitting for long periods, eating fast food, and playing passive video games (Park et al., 2020; Alresheedi & Rabbani, 2022).

In general, it is recommended to treat each chronic condition according to the disease-specific guidelines. Still, in clinical practice physicians do not adjust or discuss the applicability of recommendations for patients with chronic diseases (including hypertension and T2DM) and following all guidelines for each and every medication a patient is taking will certainly cause medication non adherence and polypharmacy (Park et al., 2020; Nguyen et al., 2008). T2DM management comprises both nonpharmacological approaches, such as a healthy diet and lifestyle, and pharmacological approaches (Nguyen et al., 2008). Adherence to antidiabetic medications is a key element in managing T2DM. In diabetic patients, medication non adherence has been shown to be associated with poor glycaemic control, microvascular complications, and death (Saraiva et al., 2020).

For many years, different approaches have been developed to measure medication adherence, and they can be grouped into two types: direct and indirect (Anghel et al., 2019). Direct approaches include patient observation, biomarker measurement, and assays for drug levels. Indirect methods include self-reporting, pill counting, and electronic monitoring. Self-reports (including scale questionnaires) are one of the most used indirect methods to measure medication adherence (Lam & Fresco, 2015; Özdemir & Endrenyi, 2019). For questionnaires, the Morisky Medication Adherence Scale (MMAS-8) has shown significant validity and reliability in measuring adherence in patients with chronic diseases such as diabetes and hypertension (Lam & Fresco, 2015).

MMAS-8 has been proposed to serve as an assessment tool in clinical situations, as it is considered one of the most accepted self-reported medication-adherence measures (Uchmanowicz et al., 2019). Studies have shown that MMAS-8 relates strongly with several important long-term outcomes, including behavioural changes for patients receiving educational counselling, the proportion of patients having more control over their medical conditions, emergency department visit rates, hospital admission rates, morbidity, and mortality (Uchmanowicz et al., 2019; Al-Haj et al., 2016).

Medication adherence to chronic diseases such as T2DM represents a huge concern for healthcare stakeholders in Saudi Arabia and worldwide because of increasing evidence associating non adherence with serious negative consequences (Brown & Bussell, 2011). Although it is a well-recognized problem, few studies have investigated adherence to antidiabetic medications in Saudi Arabia. Therefore, the aim of this research study is to elucidate adherence to chronic medications among T2DM Patients in primary health care (PHC) centres the Makkah Region, Saudi Arabia.

2. MATERIALS AND METHODS

Ethical Approval

The study was approved by the Biomedical Research Ethics Committee, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia. Approval number: HAPO-02-K-012-2018-12-282, under the Declaration of Helsinki.

Study Design

A cross-sectional study was conducted among patients with T2DM. They were randomly approached and interviewed in ten PHC centres in the Makkah Region. The data collection from March 2021 to February 2022.The purpose of the research was explained to participants. They were also informed that participation was voluntary.

Questionnaire Tool

The questionnaire was divided into two main parts: the first part included bassline characteristics of participants (such as age , sex, weight and hight) and the second part included medications adherence questions assessed using MMAS-8, which is composed of seven items with yes/no response options and one item with a 5-point Likert scale response option (Morisky et al., 2008). These items provide information about the barriers to medication adherence, such as forgetting to take medications, not taking medications when feeling worse, and difficulties in complying with a treatment regimen. All participants were administered an MMAS-8 questionnaire for adherence to antidiabetic medications. With a sum of scores equalling 8, 6 to <8, or <6, patients can be categorized as having high, medium, or low adherence to therapy, respectively. The questionnaire was translated into Arabic, the local spoken language, by a proficient speaker of both English and Arabic and was revised to suit the general population.

Study Populations (Inclusion/Exclusion Criteria)

The selection criteria included adults (men and non-pregnant women) above 18 years of age with T2DM (anHbA1c level of ≥6.5% (≥48 mmol/mol) as a cut-off for diagnosing T2DM in non-pregnant adult (WHO, 2011) who were taking antidiabetic medications and attending the primary care service in Makkah. Exclusion criteria: inability to give informed consent; pregnancy, associated serious medical or surgical condition requiring hospitalization.

Sample size and data Collection

The sample size was calculated using Slovin's formula, with a population size of519 patients with T2DM in Saudi Arabia from a recently published study by Al-Rubeaan et al., (2020), with a confidence interval (CI) of 95% and a margin of error of 5% (Al-Rubeaan et al., 2020). After obtaining informed consent, participants will be enrolled into the study. Patient age, weight, Hight, HbA1c, blood pressure, pulse and details on medications will be recorded by questionnaire and cross-checked from health records. The data were collected on paper and then transcribed into a standardised spreadsheet (Microsoft Excel, 2010).

Statistical Analysis

Data were analysed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). Categorical variables are presented as frequencies and percentages. Pearson's chi-square test was used to measure any relationship between variables. A P-value of <0.05 was considered statistically significant.

3. RESULTS

A total of 234 T2DM patients were enrolled in the study, of which 224 completed the study, and their baseline characteristics are shown in Table 1. The participants' average age was 60 years, height was 165 cm, and weight was 81 kg. The participants' average measured HbA1c was 7.5%, blood pressure was 138/77 mmHg and pulse rate were 85 bpm also, females represented 78% of the participants included in the study. As to antidiabetic medication classes, biguanides were the most commonly used (87%), sulfonylurea (44%), dipeptidyl peptidase-4 inhibitors (16%), and insulin (16%). Regarding chronic medications, all patients were taking antihypertensive medications; 19% were taking lipid-lowering medications, and 7% were taking anticoagulation medications. However, only a small proportion (2%) was using other medications, such as for rheumatoid arthritis, gout, hypothyroidism, orgastroesophageal reflux diseases. In term of overall number of all medications (both antidiabetic and chronic) used by the T2DM patients, (62%) of patients used less than five medications per day, (22%) used five medication per day and (16%) used more than five medications.

Table 1 Baseline characteristics of participants N= 224.

Average		
	Age (year)	60
	Height (cm)	165
	Weight (kg)	81
	HbA1c (%)	7.5
	Blood pressure (mmhg)	138/77
	Pulse (bpm)	85
Frequency (%)		
Gender	Female	175 (78%)
	Male	55 (24%)
Class of antidiabetic medications	Biguanides	196 (87%)
	Sulfonylurea	99 (44%)
	Dipeptidyl peptidase-4 inhibitors	37 (16%)
	Insulin	37(16%)
Class of chronic medications	Anti-hypertensive medications	224(100%)
	Lipid-lowering medications	44 (19%)
	Anti-coagulation medications	17 (7%)
	Other medications	6 (2%)

All medications used	<five medications	139(62%)
	≥ five medications	85(38%)

* Include both antidiabetic and chronic medications

As to Management approach, 48% of participants were taking monotherapy, 42% were taking combination therapy (two drugs) andonly 10% were taking combination therapy (three drugs) as shown in Figure 1. As shown in Table 2, 58% of patients replied that they sometimes forgot to take their medications. During the previous two weeks, 70% of patients did not take their medications. Almost two third of patients (79%) cut back or stopped taking their medications without telling their doctors because they felt worse when taking them. Most patients (85%) stopped taking their medications when they felt that their diabetes is under control, and 61% answered that taking medication every day was a real inconvenience and that they felt hassled about sticking to their treatment plan. In terms of finding difficulty in remembering to take all medications, almost half of patients 53% said that they never or rarely found it difficult to take all medications, while 21% admitted that they occasionally found it difficult to remember, 18% said sometimes, 7% said usually, and only 2% said that they always found it difficult to remember. Overall, almost half of the patients showed a low level of medication adherence, 37% showed medium medication adherence, and only 11% showed high medication adherence.

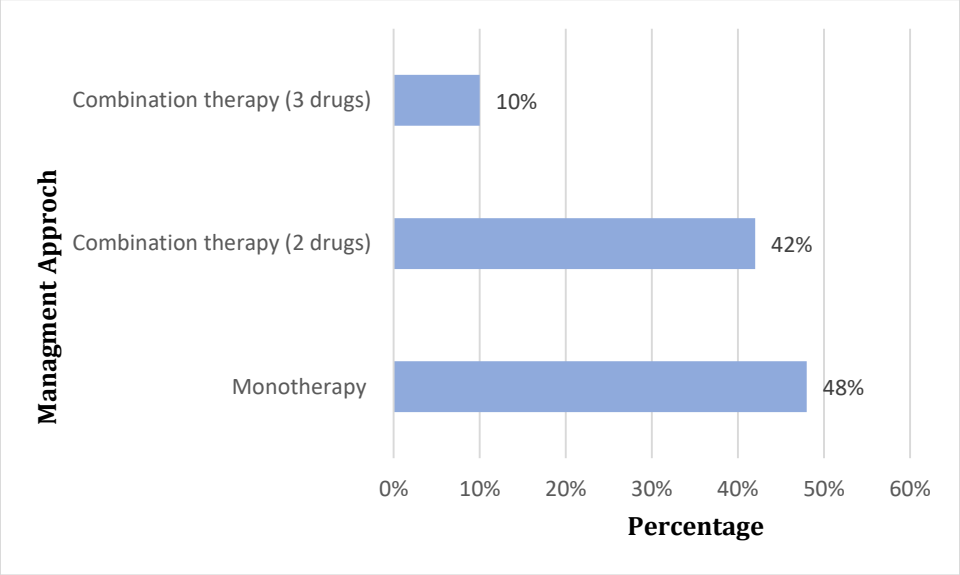

Figure 1 Management approach of T2DM patients.

Table 2 Morisky Medication Adherence Scale -8

Questions	Frequency (%)	
	No	Yes
Do you sometimes forget to take your medication(s)?	53 (42%)	131 (58%)
People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medication(s)?	65 (30%)	159 (70%)
Have you ever cut back or stopped taking your medication(s) without telling your doctor, because you felt worse when you took it?	45 (21%)	179 (79%)
When you travel or leave home, do you sometimes forget to bring along your medication(s)?	77 (35%)	147 (65%)
Did you take your medication(s) yesterday?	122 (55%)	102 (45%)
When you feel like your diabetes is under control, do you sometimes stop taking your medication(s)?	32 (15%)	192 (85%)

Taking medication(s) every day is a real inconvenience for some people. Do you ever feel hassled about sticking to yourantidiabetic treatment plan?	86 (39%)	138 (61%)
How often do you have difficulty remembering to take all your medication(s)? Never/Rarely Once in a while Sometimes Usually All the time	 118 (53%) 47 (21%) 40 (18%) 16 (7%) 4 (2%)	
MMAS-8 total scale**		
Low Adherence (< 6)	116 (52%)	
Medium Adherence (6 to <8)	84 (37%)	
High Adherence (= 8)	25 (11%)	

** The MMAS-8 total scale has a range of 0 to 8

As shown in Table 3, the chi-square test showed a dependent relationship (P<0.001) between management approach andnumber of all medications (both antidiabetic and chronic medications) used by T2DM patients.

Table 3 Relationship between management approach and all medications used by T2DM patients. Statistical significance was determined at a P-value of <0.05.

		Management approach			Total
		Monotherapy (1 drug)	Combination therapy (2 drugs)	Combination therapy (3 drugs)	
All Medications	< five medications	85	53	2	140
	≥ five medications	22	41	21	84
Total		107	94	23	224
Pearson's Chi-Square		P <0.001			
Likelihood Ratio		P <0.001			

4. DISCUSSION

The aim of this study was to elucidate adherence to chronic medications among T2DM Patients in primary heath care centres the Makkah Region, Saudi Arabia. Clinical studies have shown that among the various methods for measuring medication adherence (including for T2DM), self-reporting measures remain the most common approach (Karpek et al., 2004; Morisky et al., 1986). Biguanides (mostly metformin), was the most prescribed medication in this study (78%). Clinical trials have shown that metformin can be used as a monotherapy or combination therapy with antidiabetic medication to treat T2DM (Li et al., 2021). Patients with T2DM are initially advised to make lifestyle and diet modifications to control their blood glucose. However, over time, most patients will require additional pharmacological interventions (Inzucchi et al., 2015). At present, metformin is the recommended first-line antidiabetic medication, and it can be used as a monotherapy (Nathan et al., 2009). This could explain monotherapy being used by almost half of the patients with T2DM in the current study.

Females represented the most common gender (78%) in the current study. Earlier studies have indicated that women have a higher risk of chronic diseases such as cardiovascular disease and T2DM than men (Wei et al., 2017; Wang et al., 2019). Furthermore, medication nonadherence among chronic patients has been found to be more common in women than in men, and chronic patients were unlikely to obtain their medications and monitor them as recommended by clinical guidelines (Vlassoff, 2007). When the patients were asked about medications, the highest percentages for a "yes" answer were to the questions, "Have you ever stopped taking your medications without telling your doctor because you felt worse when you took them?" (79%) and "When you feel like your diabetes is under control, do you sometimes stop taking your medications?" (85%). Both answers reflect a lack of knowledge and awareness of proper medication use among T2DM patients. This highlights the importance of spending more time with

patients to give clear medication instructions and explain the consequences of medication nonadherence, such as increasing the risk of disease progression and prolonged hospitalization (Jimmy & Jose, 2011).

In our study, (38%) patients received five or more chronic medications. Although, there is no consensus on the definition of polypharmacy in the literature, still, a numerical definition of five or more medications per day is mainly referred to (Masnoon et al., 2017; WHO, 2019). Healthcare professionals became concerned about polypharmacy to prevent or minimize its negative outcomes including adverse drug reaction, drug-drug interactions, non-adherence to medications, and greater health care costs (Maher et al., 2014). A number of various approaches to decrease polypharmacy and inappropriate medication prescribing have been suggested, but no considerable evidence from appropriately powered randomized controlled trials exists about their practicality for use in primary care centers or their impact on patient health (Rieckert et al., 2018; Mangin et al., 2018).

In the current study, the level of adherence to medications was found to be unsatisfying, as almost half of the patients (52%) showed low adherence to medications. This is similar to the results of other studies conducted in the Bisha, Riyadh and Khobar regions in Saudi Arabia (Balkhi et al., 2019; Alqarni et al., 2019; Al Qarni et al., 2019). The results emphasize the need for better management of PHC providers to improve patient viewpoints on and awareness of adhering to prescribed antidiabetic medications. Pharmacogenomics provides a possible intervention to improve medications adherence. However, there is limited and mixed evidence that pharmacogenomic information might improve adherence (Klein et al., 2004). The present study, conducted among T2DM patients in Saudi Arabia, will add to the knowledge in this area, and there are still a limited number of studies addressing medication nonadherence among chronic patients in general. Furthermore, the data were collected through interviewing the patients, and if they did not understand a question or a choice, it was directly explained and clarified to them, which left no room for misunderstanding the questions.

5. CONCLUSION

Most patients with T2DM in this study had low or medium medication adherence rates. Patient education is required to improve awareness regarding medication adherence in managing diabetes. More comprehensive studies are needed to explore medication nonadherence and identify factors contributing to this problem to be able to provide effective strategies to improve medication adherence among T2DM patients in Saudi Arabia.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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