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Original Research Article

Effect of Medication Adherence to Oral Hypoglycemic Drugs on Glycemic Control in Type 2 Diabetic Patients: a Cross Sectional Study

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Abstract

Background: Lack of medication adherence to anti-diabetic therapy causes suboptimal glycemic control and leads to treatment failure and increased mortality from diabetes complications. The study aimed to assess medication adherence among type 2 diabetes mellitus patients at outpatient setting and its correlation with glycemic control. ***Methods:*** A cross-sectional observational study was conducted between January 2019 and March 2019 at several outpatient clinics in Ibb city, Yemen. A total of 370 patients of type 2 diabetes mellitus who use oral hypoglycemic drug therapy for at least 3 months were enrolled in the study. Fasting and postprandial blood glucose as well as glycosylated hemoglobin were measured and details of drug therapy were noted. Morisky Medication Adherence Scale was used to assess medication adherence. ***Results:*** Only 1.1% of type 2 diabetes mellitus patients had high medication adherence to oral hypoglycemic drugs, while 61.9% had moderate and 37% had low medication adherence. Most common medication adherence issues identified in type 2 diabetes mellitus patients were forgetting to take their medication when traveling, stopping of medication once feeling better, and difficulty to adhere to medication plan. Only 12.1% were having optimally controlled glycemic levels, whereas 87.8% were having uncontrolled glycemic levels. ***Conclusions:*** Despite having a good overall medication adherence among type 2 diabetes mellitus patients, the glycemic control still low in most patients. The study shows urgent need for reviewing anti-diabetic pharmacotherapy, counseling, and health education of patients.

Keywords: Medication adherence, Morisky Medication Adherence Scale, Type 2 diabetes mellitus.

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INTRODUCTION

Diabetes mellitus is one of the most common worldwide chronic diseases that have reached epidemic proportions, and its incidence and prevalence continue to increase. Several new hypoglycemic drugs have been introduced into diabetes treatment algorithms aiming to achieve optimal glycemic control. Yet, non-adherence to anti-diabetic medications declines the efficacy of treatment and in turn the glycemic control [1].

Medication adherence is an active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce therapeutic results [2]. Adherence to anti-diabetic medications has been shown to improve glycemic control and predicts the long-term prognosis of the disease [3, 4]. Poor adherence to the anti-diabetic medications is associated with inadequate glycemic control, higher costs, wasting of healthcare resources, and higher mortality rates [5, 4].

Pharmacologic treatment for diabetes mellitus is complex and can involve taking several drugs with multiple dosing frequencies, as well as administration of exogenous insulin. The rates of medication adherence to anti-diabetic therapy vary greatly in the literature [6], and there is evidence that complex therapeutic regimens are associated with lesser adherence [7]. Lacking of published clinical studies describing the medication adherence among in type 2 diabetic patients in Yemen necessitates conducting studies to address the problem as well as to understand the compliance of diabetic patients regarding the use of oral hypoglycemic drugs.

Aims of the Study

The study aimed to assess the medication adherence to oral hypoglycemic drugs among type 2 diabetes patients at outpatient settings in Ibb city, Yemen, and correlation with the glycemic control.

METHODS

Study Design

A cross-sectional study was conducted at several outpatient clinics and medical laboratories in Ibb city, Yemen, from January 2019 to March 2019. Ethical approval was obtained from the Institutional Research Ethics Committee. The study sample included adult patients from different age categories.

Data Collection and Analysis

Adult patients diagnosed with type 2 diabetes taking hypoglycemic drug therapy for more than 3 months attending outpatient clinics were included and interviewed after taking informed consent. Their demographic data along with details of duration of treatment, current anti-diabetic drug therapy, medication adherence were obtained. Fasting and postprandial blood glucose as well as glycosylated hemoglobin (HbA1c) were measured. Other comorbidities such as hypertension and ischemic heart diseases were also recoded. The study excluded type 1 diabetic patients, newly diagnosed type 2 diabetic patients on anti-diabetic drug therapy for less than 3 months, and diabetic patients not willing to participate in the study and/or blood glucose measurement. Patients were further categorized as having optimal glycemic level based on the blood glucose level based on the blood glucose level (fasting <130 mg/dL and/or postprandial <180 mg/dL) and/or on glycosylated hemoglobin level (HbA1c<7 %).

Medication adherence was assessed using 8-item Morisky Medication Adherence Scale (MMAS-8) after its translation into Arabic language. MMAS-8 is a self-report questionnaire with eight items (questions) with good validity and internal reliability. The scale is designed to facilitate identification of barriers to behaviors associated with adherence to medications. Response categories are yes/no for each item with a dichotomous response and a 5-point Likert response for the last question. Based upon the responses, each item is scored and a total score is calculated. Scores on the MMAS-8 were categorized as: 0 - 6 = low; 6 = medium; and 7 - 8 = high [8, 9]. In developing countries, the socioeconomic status of the patients plays significant role in medication adherence. Thus, two items were also added to the questionnaire to assess the effect of patients' concerns about side effects of the drug therapy, and the cost of drugs on the adherence to anti-diabetic therapy.

Statistical Analysis

Data obtained were entered in Microsoft Excel version 2010. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21. Data were expressed in actual number, mean, percentage; t-test was used to compare between two groups. Probability p-value of less than 0.05 was considered as statistically significant.

RESULTS

A total of 370 type 2 diabetes mellitus patients were included and analyzed. The mean age of the sample was 51.9 (±11.8) years and male:female ratio was 41.4:58.6 (Table-1). A total of 937 drugs products were prescribed for the 370 patients. Thus, the average number of drugs per patient was 2.5 drugs with a range between 1 and 7. Most of the anti-diabetic medications were combination generic drug products.

Table-1: Characteristics of type 2 diabetic patients enrolled in the study

Patient characteristics		Value
Patient with type 2 diabetes		370
Age in years (mean ± SD)		51.9 ± 11.8
Gender	Male	153 (41.4%)
	Female	217 (58.6%)
Duration of treatment in years (mean ± SD)		4.5 ± 3.1
Number of medications (mean± SD)		2.5 ± 1.5
Mean blood glucose (mg/dL)	Fasting	197.1 ± 81.5
	Postprandial	233.1 ± 94.1
	HbA1c	9.7 ± 2.5
Glycemic status	Controlled level	47 (12.7%)
	Uncontrolled level	323 (87.3%)

Responses of patients were analyzed; 25.9% said they forgot to take medicines when staying away from home and/or traveling; 24.9% complained of inconvenience and difficulty in adhering to medication plan; 17.6% said they forget to take medicines; 19.5% they just missed their medications with in the last two weeks; and 15.4% said they stopped taking their medicines because they believed that their disease was under control. Responses of the included patients to the items of MMAS-8 are summarized in Table-2.

Table-2: Responses of the participants to individual items of MMAS-8

Questions		Yes (%)	No (%)
1	Do you sometimes forget to take your anti-diabetic pills?	17.6	82.4
2	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 medicine?	19.5	80.5
3	Have you ever cut back or stopped taking your anti-diabetic medication without telling your doctor, because you felt worse when you took it?	17.8	82.2
4	When you travel or leave home, do you sometimes forget to bring along your anti-diabetic medication?	25.9	74.1
5	Did you take all your medicine yesterday?	84.6	15.4
6	When you feel like your symptoms are under control, do you sometimes stop taking your medicine?	15.4	84.6
7	Taking anti-diabetic medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your anti-diabetic treatment plan?	24.9	75.1
8	How often do you have difficulty remembering to take all your anti-diabetic medication?		
	Never/rarely	55.7	
	Once in a while	13.5	
	Sometimes	15.1	
	Usually	8.6	
	All the time	7	

In the current study, based upon the total MMAS-8 score, only 1.1% had perfect/ high medication adherence, while 61.9% had moderate and 37% had low medication adherence (Table-3).

Table-3: Level of medication adherence among type 2 diabetes patients

Medication adherence level (as per MMAS-8)	Percentage
Low adherence (score <6)	37
Moderate adherence (score 6 to <8)	61.9
Perfect adherence (score 8)	1.1

The low socioeconomic characteristics of populations in underdeveloped countries, including Yemen, play major role in medication adherence habits. Thus, additional two questions were added into the MMAS-8 to assess the effects of apprehension from side effects of medications as well as the cost of drugs on medication adherence. About 11.6 % had stopped medications due to concerns about side effects while 18.2% stopped medications due to hefty price (Table-4).

Table-4: Responses of the participants to concerns about side effects and medication price

Questions		Yes (%)	No (%)
1	Do you stop taking your medicine because you fear side effects?	11.6	88.4
2	Do you stop taking your medicine because they are expensive?	18.1	81.9

Type 2 diabetic patients were further analyzed based upon glycemic status. Only 12.7% were having controlled blood glucose levels, whereas 87.3% were having uncontrolled blood glucose levels despite being on anti-diabetic drug therapy (Figure-1). On subgroup analysis, MMAS-8 score was higher in uncontrolled group in comparison with controlled group, but the difference was not statistically significant (Table-5).

Table-5: Comparison of medication adherence score between diabetic patients with controlled and uncontrolled glycemic levels

Variable	Glycemic status		p-value*
	Controlled	Uncontrolled	
MMAS-score (mean ± SD)	5.4±1.9	5.7±1.8	0.28

* p-value between group comparisons by independent t-test

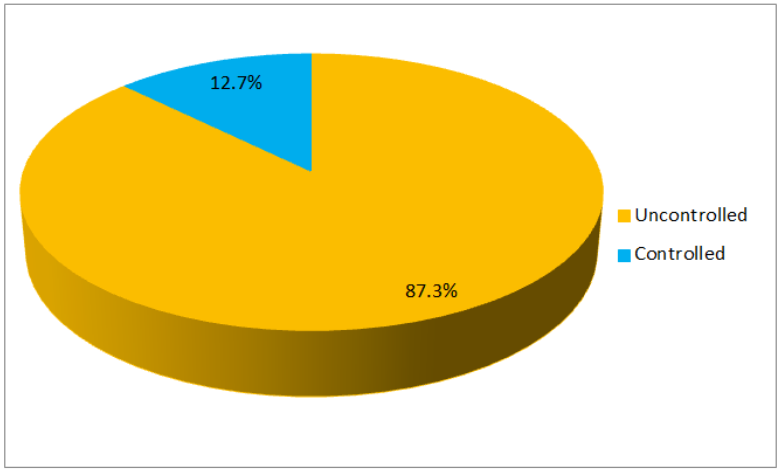

Fig-1: Glycemic control among type 2 diabetes mellitus patients

DISCUSSION

The results of present study have shown that medication adherence was low among 37% of type 2 diabetic patients and suggest causes of non-adherence. Studies throughout the world using research assessment tools and systematic reviews have addressed poor medication adherence among type 2 diabetic patients [10-12].

Using MMAS-8, which is a reliable and validated research tool, medication adherence was assessed in the present study. This measure is designed to identify barriers and habits associated with adherence to medications [8, 9]. Only 1.1% had high while 61.9% had moderate and 37% had low adherence to anti-diabetic medication. It was observed that about 25.9% of patients forget to take medicines while traveling and/or staying outside home. Also, about 24.9% felt it was difficult to stick to the prescribed treatment plan and so stopped medication. Some of them stopped taking their drugs because they believed that their disease was under control. Others forget taking their anti-diabetic medications.

The findings of the medication adherence in the present study are better than findings of some Indian studies documenting poor medication adherence among diabetic patients. One study reported that 16.6% adherence to the prescribed anti-diabetic drugs, and majority often forgot to take their medications [11]. Another study reported 21.8% high adherence, 43.3% moderate adherence, and 35.3% low adherence toward anti-diabetic therapy [13]. Other study documented high adherence in 9.8% diabetic patients, majority were on three-drug combination therapy and showed poor glycemic control with poor compliance to drug therapy [14].

However, another studies documented better medication adherence than that of the present study. One study showed high adherence among 40.95%, moderate adherence among 37.14%, and poor adherence among 21.9% [15]. Another study recorded that the majority (60%) had high medication adherence regardless the number of drugs prescribed [16]. Similarly, another study reported high adherence among 64.9% of diabetic patients, moderate adherence in 29.8%, and poor adherence in 5.29% [17]. This better adherence to anti-diabetic therapy could be attributed to increased awareness about diabetes mellitus and its complication.

The present study showed that11.6 % of patients had stopped their anti-diabetic medications due to concerns about adverse effects of the drugs and 18.2% stopped medications due to high medication price. Similar results showed that low-income patients were less adherent to the prescribed anti-diabetic therapy that high-income patients [13]. These results may illustrate the role of socioeconomic status of the patient on the medication adherence in developing countries.

Despite the quite good medication adherence in the results of the present study, analysis of data revealed that only 12.7% of type 2 diabetic patients were having adequate glycemic control, whereas 87.3% were having uncontrolled glycemic control. Glycemic control can be affected by multiple factors such as dietary adherence, regular physical activity, and perhaps most important is the appropriate anti-diabetic drug therapy. Efficacy and glycemic control decline as medication adherence decreases [1].

CONCLUSIONS

Diabetes mellitus is a chronic disorder that requires lifelong compliance with treatment regimen. Efforts should be made to address the reasons for suboptimal glycemic control medication adherence and to initiate steps to improve it. These steps include revising the choice of prescribed oral hypoglycemic drugs, limiting total number of prescribed medications,

and simplifying the dosage regimen to improve the medication adherence to hypoglycemic drugs. Additionally, patient counseling and education on the importance of medication adherence, life-style modifications, and considering the cost of anti-diabetic medications in order to achieve optimal glycemic control.

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Disclosure

The author reports no conflicts of interest in this work.

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