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Original Article

Level of adherence and associated factors to medication use in patients with diabetes mellitus

Nível de adesão e fatores associados ao uso de medicamentos em pacientes com diabetes mellitus

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ABSTRACT

Objective: to identify the level of medication adherence practices and associated factors among patients with diabetes mellitus. **Methods:** this cross-sectional descriptive study was conducted among diabetes mellitus patients at selected health centers in Tabuk, Saudi Arabia. A total of 218 participants were selected based on inclusion and exclusion criteria. The Medication Adherence Practice Scale with a maximum score of 50 was used to collect the data. **Results:** the mean medication adherence practice score was 28.64 ± 8.47. 65.1% of the participants had moderate adherence, 27.5% had high medication adherence, and 7.3% had low medication adherence. The multiple regression analysis showed that educational status (p=0.000), co-morbidity (p=0.001), monitoring of blood glucose (p=0.002), complications p=0.000), alternative therapies (p=0.000) and HbA1C level (p=0.000) were the significant predictors of medication adherence practice. **Conclusion:** this study identified the moderate medication adherence practices. Medication Adherence Practice was significantly associated with income, age, marital status, family size, educational status, occupation, years on diabetes medications, co-morbidity, medications for any other problems, number of antidiabetic drugs, source of medication adherence, regular monitoring, complications, and HbA1C level. **Contributions to practice:** studying the predictors of medication adherence practice of Diabetes Mellitus will enhance the health care interventions.

Descriptors: Medication Adherence; Diabetes Mellitus; Drug Therapy; Treatment Adherence and Compliance.

RESUMO

Objetivo: identificar o nível de práticas de adesão medicamentosa e os fatores associados entre pacientes com diabetes mellitus. **Métodos:** estudo descritivo transversal, realizado entre pacientes com diabetes mellitus em centros de saúde na Arábia Saudita. Foram selecionados 218 participantes com base nos critérios de inclusão e exclusão. A Escala de Prática de Adesão Medicamentosa, com pontuação máxima de 50, foi utilizada para coletar os dados. **Resultados:** a média da pontuação de prática de adesão medicamentosa foi de 28,64 ± 8,47. 65,1% dos participantes apresentaram adesão moderada, 27,5% alta e 7,3% baixa. A análise de regressão múltipla mostrou que o nível educacional (p=0,000), comorbidade (p=0,001), monitoramento da glicemia (p=0,002), complicações (p=0,000), terapias alternativas (p=0,000) e nível de HbA1C (p=0,000) foram preditores significativos. **Conclusão:** identificou-se práticas de adesão moderada aos medicamentos. Esta, também, foi significativamente associada à renda, idade, estado civil, tamanho da família, nível educacional, ocupação, anos de uso de medicamentos para diabetes, comorbidade, uso de medicamentos para outros problemas, número de medicamentos antidiabéticos, fonte de adesão aos medicamentos, monitoramento regular, complicações e nível de HbA1C. **Contribuições para a prática:** estudar os preditores das práticas de adesão medicamentosa do Diabetes Mellitus contribuirá para a melhoria das intervenções de saúde.

Descritores: Adesão à Medicação; Diabetes Mellitus; Tratamento Farmacológico; Cooperação e Adesão ao Tratamento.

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Introduction

Global health is threatened by the Diabetes Mellitus (DM) epidemic, posing a significant risk to human health. According to the International Diabetes Federation (IDF) Diabetes Atlas, 10.5% of adults aged 20-79 have diabetes, and almost half of them are unaware of their condition globally. The IDF projects that by 2045, 1 in 8 adults, around 783 million people, will have diabetes, marking a 46% increase globally. Within the Middle East and North Africa (MENA) Region, estimates were created for twenty-one nations and territories[1].

With a 16.2% regional prevalence and an estimated 86% growth, the MENA Region is expected to have 136 million individuals with diabetes by 2045, the second-highest increase of any region. The largest percentage of mortality among working-age individuals due to diabetes (24.5%) occurs in the MENA Region. Despite the fact that the MENA Region is home to 3.4% of the world's diabetes spending, just 32.6 billion USD were spent there. According to data from the IDF, the standardized prevalence of diabetes (including all forms) among adults in the Kingdom of Saudi Arabia was 18.7% in 2021. This number is expected to rise to 21.4% by 2045[1].

The self-care for patients with DM and medication adherence are the keys to treatment success of Diabetes Mellitus[2]. Even though the DM prevalence figures are rising up, non-adherence to the medications has been reported in recent studies[2-3]. This discovery revealed that patients with diabetes mellitus are still struggling with not following their medication regimen[4]. Maintaining strict control of blood sugar levels is crucial, and adhering well to treatment is linked to a reduced risk of complications and fewer hospitalizations in individuals with type 2 diabetes[5]. Many individuals with type 2 diabetes fail to follow their medication regimen as directed, resulting in unfavorable results[6]. Failure to follow medication instructions is a difficult problem that affects people globally, leading to disease advancement and higher treatment expenses[4-5].

Studies from Saudi Arabia reported the most common complications faced by DM patients were nephropathy, retinopathy, neuropathy, and coronary artery disease[7-8]. Those complications can pose serious risks to life. High adherence to medication significantly reduces the diabetic retinopathy treatment necessity. Therefore, it is crucial to encourage adherence to DM medication in order to avoid the risks of diabetic retinopathy worsening, particularly among individuals with poor medication adherence. In older clients with poorly controlled type 2 diabetes, diabetes foot is prevalent. Amputations, gangrene, foot ulcers, bone abnormalities, ingrown toenails, Charcot's foot, and calluses were the most frequent foot problems[8-9].

As a result, effective management is possible when patients adhere to appropriate treatment and control measures. Understanding and knowledge of self-care training and diabetes education are crucial for the management and care of diabetes[10]. It is vital for individuals with DM to have a good understanding of the disease's characteristics, risk factors, potential complications, and available treatment options for managing complications. It is also essential to comply with adequate practices to prevent complications of DM[11]. Not adhering to medication properly could lead to poor control of blood glucose levels. The government aims to achieve the goal of no increase in diabetes-related deaths by 2025 and of reducing the number of diabetes cases by 10% by 2030. In order to accomplish this, the government educational initiatives and campaigns aimed at increasing public awareness about the illness[12].

Adherence to medication regimens can significantly influence health outcomes, life expectancy, and overall healthcare expenses. Achieving medication adherence and persistence requires active patient and healthcare team participation[13]. Medication adherence was influenced by religion, lack of education, comorbidities, social factors, gender, education status, residence, monthly income, and duration of diabetes[13-15]. Continuing communication by the nurses with the patient is essential through face-to-face

counseling, electronic reminders, simplifying the patient treatment regimen, monitoring the side effects, telephone follow-up, etc. Encouraging these nurse-led interventions is essential in enhancing adherence practices.

DM requires continuous management and therapy. It is essential to document the concern of Medication Adherence Practice, to enhance the care. There is little data available about the level of medication adherence practices and factors associated with adherence practices among DM patients in the study area. This causes an intervention gap in the management of diabetes which results in escalating the complication rate. This study was intended to answer the following questions. What are the levels of medication adherence practices among the DM patients?, and What are the associated factors among DM patients in adhering to the medication adherence practices?

The purpose of this study was to identify the level of medication adherence practices and associated factors among patients with diabetes mellitus.

Methods

This study was used cross-sectional descriptive research design. This study was carried out for 6 months from August 2022 in chronic diseases outpatient clinic of selected Primary Health Centers (PHC) at Tabuk, Saudi Arabia. Participants were recruited using a convenience sampling technique from three PHCs. The DM patients were contacted based on the inclusion and exclusion criteria when arrived for their appointment. The interested participants who agreed willingly to participate in the study were included in the study. The following DM patients were excluded from the sample list: the DM patients who were less than 20 years old, DM therapy less than 6 months and the DM patients with the presence of any condition that affect the responses in the study. The calculated sample size was 324 based on the previous studies adherence rates[5,10]. However, 218 responses were achieved with in the time frame of the study.

Data on the sociodemographic factors, patient-related clinical factors, medication adherence practices of DM medications were gathered using a structured questionnaire with closed-ended questions. It included three parts. The first part of the tool consists of patients' sociodemographic characteristics such as age, gender, marital status, family size, education, occupation and family monthly income in managing diabetes. The second part of the tool focused on diabetes-related clinical data from the patients involved in the study. It includes duration of diabetes, years of DM medication use, co-morbid conditions, medications for any other problems, type of medications, number of antidiabetic drugs, source of medication adherence, monitor regular blood glucose, complications due to diabetes, use of alternative therapy and HbA1C level. The third part of the tool consists of Medication Adherence practice scale. This tool was developed based on the previous studies[5,10,14].

Validity of the tool was ensured with the nursing experts. The tool consists of 10 items on a 5-point scale (ranging from strictly observed to never observe) with a maximum score of 50. The items address challenges related to medication adherence, including remembering to take medications, workload, travel, side effects, hopelessness, fear of hypoglycemia, among others. The overall score was categorized as fallows: 8-10 points represents high adherence, 6-8 points represents medium adherence, and less than 6 points indicates low adherence. This scoring pattern was set based on the result of previous studies[5,10,14].

A pilot study of 25 patients was conducted to evaluate the reliability of the tool, which yielded a reliability coefficient [-Cronbach's] of 0.74. The tool was administered in Arabic. Front and forth translation of the tool was done with the experts. Before responding to the items in the instrument, participants were informed about the general purpose of the research and their right to withdraw from the study at any time. After a detailed explanation, consent was obtained. The participants were explained about their right to withdraw from the study at any time. The study's patient

involvement was entirely voluntary. Confidentiality and anonymity was maintained throughout the study by coding the responses.

Version 21 of SPSS was used to enter and analyze the data. Descriptive statistics and inferential statistics were used to analyze the data. The study's findings were presented in tables and expressed as frequencies and percentages. To identify independent variables linked with Medication Adherence Practices, Chi-square test and Multiple regression analysis were performed. A p-value of less than 0.05 is deemed statistically significant.

The study was approved by Research Ethics Committee at University of Tabuk, Department of Nursing (No: 2-03-09-2021).

Results

Most of the participants (33.9%) were from the age group of more than 61 years, more than one--fourth of the participants (27.5%) were from the age group of 51 – 60 years, more than half the participants (57.8%) were female and remaining 42.2% were male. Nearly three-fourths of the participants (72.5%) were married. With regards to family size, more than half of the participants (52.3%) were from <5 members in a family, and the remaining participants (47.7%) were from > 5 members. 40.4% of participants were from the higher secondary educational status, nearly one-fourth of the participants (23.9%) were from intermediate, 31.2% were in private business, almost one-fourth of the participants 30.3% were employed, 16.5% were unemployed and nearly three fourth three forth of the client felt that the income was not sufficient in managing DM (73.4%).

Nearly half of the participants (46.8%) had diabetes 5- 10 years, more than one-fourth of the participants (29.4%) had diabetes less than 5 years, one--third of the participants (33.9%) were taking medications 1-3 years, 28.4% were taking medications less than 1 year, more than one third (36.70%) were had only DM, 35.8% had one comorbid condition along with DM, more than half of the participants (58.3%) were taking Medications for other problems and remaining 48.6% were not taking Medications for other problems, more than half of the participants (56.9%) were taking oral antidiabetic medication, more than one-fourth of the participants (27.5%) were taking oral antidiabetic medication and insulin.

More than half of the participants (55.1%) had previous information through health care professionals, more than one-fourth of the participants (26.6%) had previous information through family, the majority of the participants (58.7%) were not monitoring regular blood glucose and remaining 41.3% were monitoring regular blood glucose regularly. Less than half of the participants (44%) developed complications due to diabetes. The majority of the participants (62.4%) were not using any other medicine as an alternative to prescribed medications, more than half of the participants (50.5%) were not available with the recent HbA1C, 21.10% had a mild elevation of recent HbA1C and 4.6% had a moderate elevation of recent HbA1C results.

The results revealed that the mean score and standard deviation level of adherence practices regarding medication is 28.64 ± 8.47 and the mean percentage is 57. The participants reported the major reasons for Non-Adherence to Medications DM were: not remembering to take my diabetic medications (3.50 ± 1.08), skipping medications when diabetes is under control (3.23 ± 1.11), workload (3.20 ± 1.02), travel (3.20 ± 1.26) and unpleasant effect to the body (3.15 ± 1.03).

Figure 1 identified the level of Medication adherence practice, The Majority of the participants (65.1%) were from the moderate level of adherence practices regarding medication, and more than one--fourth of the participants (27.5%) were from the high level of adherence practices regarding medication and rest of the participants 7.3% of the participants were from the low level of adherence practices regarding medication.

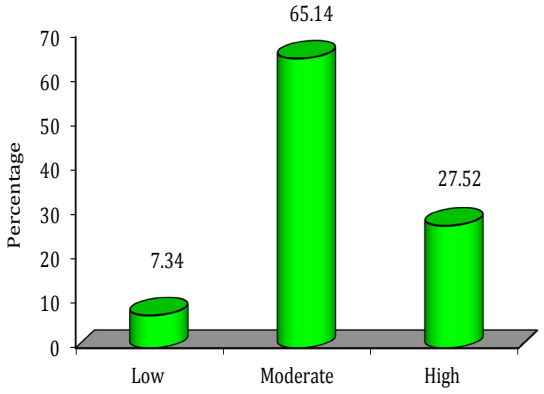

Figure 1 – Level of medical adherence of DM medications. Tabuk, Saudi Arabia, 2022

Table 1 shows the association between the level of adherence and selected demographic data. The result revealed that medication adherence practice was non-significant with gender ($\chi2$ =0.518, p=0.776). Medication Adherence Practice was significantly associated with the satisfaction of the income in managing DM ($\chi2$ = 7.19, p=0.027), a highly significant association was found between medication Adherence Practice and age ($\chi2$ = 25.96, p<0.001), marital status ($\chi2$ = 18.52, p<0.001), family size ($\chi2$ = 22.99, p<0.001), educational status ($\chi2$ = 65.53, p<0.001) and occupation ($\chi2$ =50.55, p<0.001).

Table 2 shows the association between level of adherence and selected clinical data.

Table 1 – Association for level of adherence and selected demographic data. Tabuk, Saudi Arabia, 2022

Demographic variables	Low	Moderate	High	χ2-value	p-value*
	f (%)	f (%)	f (%)		
Age (years)					
30 - 40	0 (0)	28 (12.8)	20 (9.1)		
41-50	4 (1.8)	16 (7.3)	16 (9.3)	25.96	<0.001†
51-60	8 (3.6)	46 (21.1)	6 (2.7)		
> 61	4 (1.8)	52 (23.8)	18 (8.2)		
Gender					
Male	8 (3.6)	60 (27.5)	24 (11.0)	0.518	0.776
Female	8(3.6)	82 (37.6)	36 (16.5)		
Marital status					
Married	16(7.3)	100 (45.8)	42 (19.2)		
Single	0 (0)	24 (11.0)	18 (8.2)	18.52	<0.001†
Divorced /Separated	0 (0)	18 (8.2)	0 (0)		
Family size (members)					
> 5	4 (1.8)	56 (25.6)	44 (20.1)	22.99	<0.001†
< 5	12 (5.5)	86 (39.4)	16 (7.3)		
Educational status					
Uneducated	0 (0)	4 (1.8)	0 (0)		
Elementary	8 (3.6)	34 (15.6)	0 (0)		
Intermediate	8 (3.6)	40 (18.3)	4 (1.8)	65.53	<0.001†
Higher secondary	0 (0)	44 (20.1)	44 (20.1)		
Graduate above	0 (0)	20 (9.17)	12 (5.5)		
Occupation					
Employed	0 (0)	42 (19.2)	24 (11.0)		
Private business	4 (1.8)	42 (19.2)	22 (10.0)		
Unemployed	12 (5.5)	20 (9.1)	4 (1.8)	50.55	<0.001†
Retired	0 (0)	38 (13.7)	10 (4.5)		
Monthly family income					
Yes	0 (0)	38 (17.4)	20 (9.1)	7.19	0.027‡
No	16 (7.3)	104 (47.7)	40 (18.3)		

*p-value of Pearson's Chi-square; †p<0.001 highly significant; ‡p<0.05 significant

Table 2 – Association between level of adherence and selected clinical data. Tabuk, Saudi Arabia, 2022

Demographic variables	Low f (%)	Moderate f (%)	High f (%)	χ2-value	p-value*
Duration of Diabetes (in years)					
<5	0 (0)	44 (20.1)	20 (9.1)		
5-10	12 (5.5)	54 (24.7)	36 (16.1)	22.90	<0.001†
>10	4 (1.8)	44 (20.1)	4 (1.8)		
No of years of diabetes medications usage (in years)					
<1	4 (1.8)	46 (21.1)	12 (5.5)		
1 a 3	12 (5.5)	30 (13.7)	32 (14.6)	46.14	<0.001†
3 a 6	0 (0)	34 (15.6)	0 (0)		
> 6	0 (0)	32 (14.6)	16 (7.3)		
Co-Morbid conditions					
Only Diabetes mellitus	4 (1.8)	46 (21.1)	12 (5.5)		
One comorbid	12 (5.5)	30 (13.7)	32 (14.6)		
Two comorbid	0 (0)	34 (15.6)	0 (0)	29.12	<0.001†
Three or more comorbid	0 (0)	32 (14.6)	16 (7.3)		
Medications for any other problems					
Yes	8 (3.6)	76 (34.4)	28 (12.8)	0.809	<0.001†
No	8 (3.6)	66 (30.2)	32 (14.6)		
Type of Medications you are on for the diabetes					
Oral antidiabetic	4 (1.8)	78 (35.7)	42 (19.2)	13.87	0.008‡
Oral antidiabetic +insulin	8 (3.6)	44 (20.1)	8 (3.6)		
Insulin	4 (1.8)	20 (9.1)	10 (4.5)		
Number of antidiabetic drugs					
1	4 (1.83)	68 (31.19)	24 (11.0)		
2	12 (5.50)	54 (24.77)	30 (13.7)	9.79	0.044‡
3	0 (0)	20 (9.17)	6 (2.7)		
Source of medication adherence					
Family	4 (1.8)	38 (17.4)	16 (7.3)		
Health care professional	8 (3.6)	76 (34.8)	36 (16.5)		
Mass media	0 (0)	20 (9.7)	4 (1.8)	55.95	<0.001†
Friends	0 (0)	8 (3.6)	4 (1.8)		
Self	4 (1.8)	0 (0)	0 (0)		
Monitor regular blood glucose					
Yes	8 (3.6)	44 (20.18)	38 (17.43)	18.74	<0.001†
No	8 (3.6)	98 (44.95)	22 (10.09)		
Complications due to diabetes					
Yes	12 (5.5)	74 (33.9)	10 (4.5)	28.22	<0.001†
No	4 (1.8)	68 (31.1)	50 (22.9)		
Use of alternative therapy					
Yes	4 (1.8)	68 (31.1)	10 (4.5)	18.69	<0.001†
No	12 (5.5)	74 (33.9)	50 (22.9)		
HbA1C					
Normal	0 (0)	16 (7.3)	36 (16.5)		
Mild elevation	4 (1.8)	36 (16.5)	6 (2.7)		
Moderate elevation	0 (0)	10 (4.5)	0 (0)	64.15	<0.001†
Severe elevation	0 (0)	0 (0)	0 (0)		
Not available	12 (5.5)	80 (36.7)	18 (8.2)		

*Pearson's Chi-square; †p<0.001 Highly significant; ‡p<0.05 significant

The result revealed that a significant association was found between the number of antidiabetic drugs you are prescribed and Medication Adherence Practice (χ2=9.79, p=0.044), a highly significant association was found between Medication Adherence Practice and duration of diabetes (χ2=22.90, p<0.001), years on diabetes medications (χ2=46.14, p<0.001), co-morbidity (χ2=29.12, p<0.001), medications for any other problems (χ2=0.809, p<0.001), medications on diabetes (χ2=3.87, p<0.001), source of medication adherence (χ2=55.95, p<0.001), monitor regular blood glucose (χ2=18.74, p<0.001), complications (χ2=28.22, p<0.001), use any other medicine medications (χ2=18.69, p<0.001) and recent HbA1C (χ2=64.15, p<0.001).

The results of the multiple regression analysis showed that the predictors (demographic characters d1-d7) of 30.9% variation in medication adherence (F (7, 210) = 13.43, p=0.000). The clinical factors predictors (d8-d18) showed 52.7% variation in medication adherence (F (12,205)=19.056, p=0.000) (Table 3).

Table 3 – Multiple regression analysis to analyze the demographic characters with medication adherence. Tabuk, Saudi Arabia, 2022

Model	Unstandardized coefficients		Standardized coefficients	t†	Sig.‡
	B*	Std. Error	Beta*		
Constant	16.238	4.451	–	3.648	.000
Age	-.280	.506	-.038	-.553	.581
Gender	1.114	1.081	.065	1.030	.304
Marital status	1.420	.819	.105	1.733	.085
Family size	1.167	1.222	.069	.955	.340
Educational status	4.091	.657	.493	6.229	.000
Occupation	.254	.345	.049	.735	.463
Monthly income	-4.100	1.149	-.214	-3.568	.000

*Unstandardized beta value; Std error Standard error; †t test statistic; sig.--Significant (p<0.05 significant), ‡Standardized beta value

Table 4 shows the multiple regression analysis to analyze the clinical factors with medication adherence.

The multiple regression analyses showed that educational status (β= 0.493, t= 6.229 p=0.000), monthly income (β=-.214, t= -3.568 p=0.000), presence of other health problems (β= 0.190, t=3.452 p=0.001), monitoring of blood glucose (β=-.179, t= -3.100 p=0.002), complications (β=.305, t= -5.500 p=0.000), alternative therapies (β=.336, t= 6.686 p=0.000) and HbA1C level (β=-.321, t= -5.638 p=0.000) were the significant predictors of medication adherence practice (Table 3 & 4).

Table 4 – Multiple regression analysis to analyze the clinical factors with medication adherence. Tabuk, Saudi Arabia, 2022

Model	Unstandardized coefficients		Standardized coefficients	t†	Sig.‡
	B*	Std. Error	Beta		
Constant	18.326	3.957	–	4.631	.000
Duration of diabetes	-1.194	.635	-.103	-1.880	.062
No of years of taking medications	.175	.424	.023	.413	.680
Presence of other health problem	1.363	.395	.190	3.452	.001
Taking medication for other health problems	1.673	.944	.099	1.772	.078
Type of medications	-.970	.724	-.085	-1.340	.182
Frequency of antidiabetic medications	.645	.671	.051	.960	.338
Previous information	.741	.518	.076	1.432	.154
Regular monitoring of blood glucose	-3.074	.992	-.179	-3.100	.002
Complications	5.193	.944	.305	5.500	.000
Alternative therapies	5.875	.879	.336	6.686	.000
HbA1C level	-1.549	.275	-.321	-5.638	.000

*Unstandardized beta value; Std error Standard error; †t test statistic; sig.-Significant (p<0.05 significant), ‡Standardized beta value; HbA1C - glycated hemoglobin value

Discussion

Medication compliance practices for chronic conditions remain a major public health challenge. This study revealed that 27.5% of participants had high, 65.1% of them had moderate and 7.3% of them had low adherence practices. This adherence rate was lower than other recent studies from Saudi Arabia[4,15]. The non-adherence practices rate was higher than in a study from Clinique Medicale Fraternite, Rwanda (Nonadherence -53.5%)[16]. Some studies reported moderate and low adherence[2,5,14]. A recent study from Tanzania reported a prevalence of very low adherence to medications among diabetic patients[10]. Only a few studies have reported high adherence rates[4,15,17]. Evidence indicates that medication adherence in diabetes is crucial, yet adherence to diabetes treatment varies from 30 to 80%[7,11]. These differences are due to the setting of the study and, the selection of the study participants.

A retrospective case-control study from Taiwan revealed that patients who are younger, male, and have fewer chronic illnesses or less severe diabetes complications are more likely to have difficulties with adhering to their medication[9]. Contrastingly in the present study, all the younger aged participants with 30-40 years showed moderate and high adherence practices. Increasing age resulted in low adherence. Similarly a study from Dhaka, Bangladesh revealed that increasing age was negatively associated with low adherence. This study reported a significant association between medication adherence and diabetic complications. Those patients with no DM complications exhibited better adherence practices. Similarly, a study from Bangladesh reported significant between medication non-adherences and with presence of diabetic retinopathy, microalbuminuria, dyslipidemia, hypertension, and other chronic diseases[18].

Low to high levels of education had shown increasing adherence ($p<0.001$). The patients currently employed and doing business had better scores than the retired and unemployed categories. The current study revealed that education status was a major predictor of poor medication adherence in T2DM patients. Similarly, results were supported by other studies[15].

Similarly, a recent study from Jeddah, Saudi Arabia reported medication adherence significant association with the education level of the participants[19]. Previous research identified various factors that impacted medication adherence among diabetic patients, including taking multiple medications, social and economic factors, and therapy-related issues [20]. The study found that adherence to diabetes medication was linked to reduced HbA1c levels. Similar findings were retrieved from the previous studies[2,6,21].

This study revealed that the patients who monitor blood glucose regularly, who have co-morbid conditions, duration of illness, DM complications, and the year on medications reported significant association. Similar findings were revealed from other studies[3,5,22-23]. The patients who were using alternative therapies in managing DM have shown lower adherence practices.

In this study, results were consistent with a study from the United Arab Emirates on the level of adherence being increased with oral agents than the combined group[5]. The findings on monotherapy associated with significant adherence were supported by a Bulgarian study[23].

The findings of the study reported that the longer duration of DM with lesser medication adherence practices & this finding is supported by a study from Kenya[3]. Similarly, patients with less than 5 years of DM had shown significantly lower adherence from an Indonesian study[21]. Other study has supported the findings of this study on diabetes duration and medication adherence[15]. The clients who were less number of years suffering from diabetes had moderate and high medication adherence.

In this research, the results of HBA1C showed an association with medication adherence. Most of them in the normal HBA1C group had shown high adherence. This indicates that monitoring HBA1C will help to regulate lifestyle changes. HbA1c levels are a significant predictor of morbidity and mortality among diabetic clients. Hence, it is important to always consider the medication compliance practices that help to control the glycemic index and reduce complications. Studies have reported that glycemic control helps in reducing the microvascular complications of diabetes[3,7]. A Saudi Arabian study reveals that 35% of the clients were taking three oral antidiabetic medications. Comparatively, our findings identified nearly half of the patients were having only one antidiabetic medication[24].

This study revealed that the health care professionals and family are the major support system in managing the DM and adherence practices. Healthcare providers play a role in promoting adherence, and it is advisable to adopt a multidisciplinary approach to patient care. Effective communication between he-

althcare professionals and patients improves patient satisfaction with healthcare, enhancing medication compliance[25].

It is important to investigate the influence of healthcare professionals on medication adherence, particularly in their involvement in decision-making, support, modification in lifestyle, and education[26]. In this study, the patients from a larger family reported better adherence than those from a smaller family. Similarly, a Chinese study also revealed the importance of family and social system support for medication adherence practices[7,20]. When taking into account the fact those difficulties may come and go over time, patient education and continuous communication are essential for fostering comprehension and medication adherence[27].

Study limitations

Certain constraints need to be acknowledged in this study. Due to the limited sample size and the fact that the sample was taken from selected health centers, the findings might not apply to the entire population of individuals with DM. Additionally, the research depended on self-reported factors and medication adherence practices. More research is needed to explore the connection between factors and medication adherence practices with large sample sizes, observational studies, and qualitative studies.

Contributions to practice

The nurse-led intervention needs to be initiated by various means such as explaining the importance of adherence practices and complications in addition to the associated factors of non-adherence. It is essential to track barrier monitoring in adherence to the predictors. The major reason for the non-adherence was regarding not remembering the medications. So, reinforce the importance of the therapy and always remind the client about the medication and appointments (Sehaty application in KSA). Encourage the patient to use cues to remind about the medication timing along with meal timing and phone reminders. Identify the need for alternative delivery options and remind the client when they miss appointments. Encourage the client to follow diet, exercise, and monitoring of blood glucose. It is important to improve family participation in adherence practice to promote adherence practices among DM patients.

Conclusion

This research revealed that DM patients attending the selected primary health care centers had moderate adherence to their DM medications. Despite healthcare efforts to manage DM, this research showed no strict adherence to medications among the patients. The significant associated factors were income, age, marital status, family size, educational status, occupation, years on diabetes medications, co-morbidity, medications for any other problems, number of antidiabetic drugs, source of medication adherence, regular monitoring, complications, HbA1C level. The multiple regression analyses showed that educational status, presence of other health problems, monitoring of blood glucose, complications, alternative therapies, and HbA1C level were significant predictors of medication adherence practice. There is a necessity to evaluate the effectiveness of interventions to improve the Medication Adherence Practice.

Author contribution

Conception and design or analysis and interpretation of data; Writing the manuscript or relevant critical review of the intellectual content; Final approval of the version to be published; Responsibility for all aspects of the text in guaranteeing the accuracy and integrity of any part of the manuscript: Thangam MMN.

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