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MEDICATION ADHERENCE IN OLD ADULT WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: The elderly are the fastest-growing demographic sector, with over 1.2 billion over 60 by 2025. Safe and effective pharmacological therapy for the elderly is difficult due to rising drug use. Geriatric pharmacodynamics and pharmacokinetics affect pharmacological treatment because organs deteriorate with age. The study aimed to evaluate medication adherence levels and identify predictors of poor adherence in elderly patients with type 2 diabetes mellitus (T2DM). Method: conducted as a cross-sectional study in four Primary Healthcare Centers in Baghdad from August 1, 2024, to January 1, 2025, it included 400 patients aged 60 and above with confirmed T2DM. Patients unable to participate due to physical or psychological issues were excluded. Adherence was assessed using the Morisky Medication-Taking Adherence Scale (MMAS-8). **Results:** revealed that 60.5% of patients had low adherence, 39.5% had medium adherence, and none had high adherence. Significant associations were found between adherence levels and age (P=0.005), sex (P<0.001), residency (P=0.010), education level (P=0.001), and occupation (P=0.001). Low adherence was more prevalent among patients aged over 70, females, rural residents, those with higher education, and retirees. Additionally, patients without a family history of T2DM (P=0.007), those with other chronic diseases (P=0.015), and those taking medications more frequently daily (P=0.029) had significantly lower adherence. **Conclusion:** all patients exhibited low to medium adherence, with no high adherence observed. Key predictors of lower adherence included age over 70, female sex, rural residency, higher education, retirement, absence of a family history of T2DM, presence of other chronic diseases, and increased daily medication frequency. These findings highlight the need for targeted interventions to improve medication adherence in elderly T2DM patients, considering these identified predictors.

KEYWORDS: Medication, Adherence, Old Adult, Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes mellitus (DM) encompasses a collection of metabolic disorders distinguished by persistent hyperglycemia and disturbances in the metabolism of carbohydrates, fats, and proteins.[1,2] In 2021, the worldwide prevalence of diabetes was estimated to be 6.1%, impacting approximately 529 million individuals. This figure is anticipated to more than double, ultimately reaching 1.3 billion individuals within the forthcoming three decades.[3] In Iraq, diabetes impacts approximately 1.4 million individuals, with prevalence rates reported to be between 8.5% and 13.9%. A significant investigation undertaken in Basrah, Southern Iraq, encompassing more than 5,400 participants aged between 19 and 94 years, revealed an age-adjusted prevalence of diabetes amounting to 19.7%.[4] The principal objective of managing type 1 diabetes mellitus (T1DM) is to reduce the complications associated with the disease by achieving glycaemic control through the administration of insulin therapy.[5] For the management of type 2 diabetes mellitus (T2DM), therapeutic options encompass non-insulin modalities, which include insulin sensitisers, secretagogues, alpha-glucosidase inhibitors, incretin-based therapies, and sodium-glucose cotransporter-2 inhibitors. Additionally, insulin therapies, comprising both insulin and its analogues, are also available.[6] The escalating global incidence of diabetes is associated with a growing burden of morbidity and mortality, attributable to both acute and chronic complications arising from hyperglycemia.[7] Acute complications, including diabetic ketoacidosis, hyperosmolar syndrome, and hypoglycemic encephalopathy, are linked to elevated mortality rates.[8] Chronic complications are classified into two categories: microvascular complications, which include retinopathy, nephropathy, and neuropathy, and macrovascular complications, encompassing cardiovascular disease, myocardial infarction, and cerebrovascular disease.[9]

Medication adherence, which is defined as the degree to which a patient's actions correspond with clinical prescriptions, is essential for effective disease management.[10] Nonetheless, non-adherence continues to be a prevalent concern, especially in the context of chronic conditions that necessitate prolonged therapeutic interventions, resulting in considerable healthcare expenditures and less than optimal health outcomes.[11] Factors that influence adherence encompass familial and cultural backgrounds, individual characteristics, the quality of communication between patients and providers, as well as the accessibility of the healthcare system.[10] Inadequate communication between healthcare providers and patients concerning treatment plans frequently intensifies patient anxiety, fosters misunderstandings about therapy, and ultimately leads to non-adherence.[12] The global population is experiencing a swift increase in the number of elderly individuals, with projections indicating that those aged over 60 years will surpass 1.2 billion by the year 2025.[13,14] This demographic transition presents distinct challenges for the safe and effective administration of pharmacotherapy in the elderly, as age-associated organ impairment and modifications in pharmacodynamics and pharmacokinetics further complicate the management of medications.[15] Aim of the study: To evaluate medication adherence levels and identify predictors of poor medication adherence in elderly patients with T2DM.

PATIENTS AND METHODS

A cross-sectional study was conducted across four Primary Healthcare Centers in the Aladel Sector for Primary Healthcare, Al-Karkh Health Directorate, Baghdad, Iraq. The participating centers included Aladel Primary Healthcare Center, Al-A'amiriya Primary Healthcare Center, Aljameaa District Primary Healthcare Center, and Heteen District Primary Healthcare Center. The study was carried out from August 1, 2024, to January 1, 2025. Based on the Cochrane formula[16], a minimum sample size of 236 participants was required. However, the study enrolled a convenient sample of 400 patients aged 60 years or older with a confirmed diagnosis of type 2 diabetes mellitus (T2DM). Exclusion criteria included elderly patients who declined to participate or were unable to respond to the questionnaire due to physical or psychological impairments. Study Procedures: Data collection was performed using a structured, printed paper questionnaire administered by a trainee researcher. The questionnaire comprised two sections: the first section captured participants' biodata, while the second section assessed medication adherence. Data collection was conducted over 3 to 4 visits per week, with each visit lasting approximately 2 to 3 hours. The biodata section included variables such as age, sex, residency, marital status, employment status, educational level, duration of T2DM (in years), history of other chronic diseases, family history of T2DM, number of diabetic medications, total number of medications, and frequency of medication intake per day. Medication adherence was evaluated using the Morisky Medication-Taking Adherence Scale (MMAS-8).[17,18] The total adherence score ranged from 0 to 8, with scores calculated only if respondents answered at least 6 of the 8 items.[19] The first seven items of the MMAS-8 utilized dichotomous responses (yes = 0, no = 1) to minimize acquiescence bias. The eighth item employed a 5-point Likert scale, with responses ranging from “never/rarely” to “all the time.” A score of one was assigned to “never/rarely” responses, while all other responses were scored zero.[20] Adherence levels were categorized as follows: high adherence (score > 8), medium adherence (score = 6–8), and low adherence (score < 6).[19] Ethical Considerations: Ethical approval was obtained from the Arab Board of Health Specializations. Verbal consent was secured from each participant after providing a brief explanation of the study’s aims, objectives, and assurance of data confidentiality. Participants were informed of their right to decline participation or withdraw at any time. Statistical Analysis: Continuous variables were expressed as means ± standard deviations (SD), while categorical variables were presented as frequencies and percentages. Statistical differences were assessed using the Mann–Whitney U test, t-test, and Chi-Square test, as appropriate. A p-value ≤ 0.05 was considered statistically significant, indicating that the observed results were unlikely to have occurred by chance.

RESULTS

A total of 400 patients were enrolled in the current study. About 73.5 of patients had an age of 60-65 years old. Females constituted the larger proportion of the sample (57.5%) as shown in table 1.

Table 1: Sociodemographic characteristics of the participants.

Sociodemographic characteristics		N (%)
Age group (years)	60-65	294 (73.5)
	66-70	28 (7.0)
	>70	78 (19.5)
Sex	Male	170 (42.5)
	Female	230 (57.5)
Residency	Urban	390 (97.5)
	Rural	10 (2.5)
Marital state	Married	246 (61.5)

	Unmarried	6 (1.5)
	Divorced or widow	148 (37.0)
Educational level	Illiterate	102 (25.5)
	Primary school	146 (36.5)
	Secondary school	78 (19.5)
	College or higher	74 (18.5)
Occupation	Unemployed	190 (47.5)
	Employed	109 (27.3)
	Retired	101 (25.3)

Most patients (82.3%) had a family history of diabetes mellitus and 91% of them had other chronic disease as shown in table 2.

Table 2: Medical history of the patients.

Medical characteristics		**N (%)**
Family history of T2DM	Yes	329 (82.3)
	No	71 (17.8)
Patients had other chronic diseases	Yes	364 (91.0)
	No	36 (9.0)
Number of diabetic medications	1	32 (8.0)
	2	174 (43.5)
	3	158 (39.5)
	4	36 (9.0)
Number of all medications	1-4	198 (49.5)
	>4	202 (50.5)
Frequency of medications per day	Once	37 (9.3)
	Twice	40 (10.0)
	Three times	320 (80.0)
	Four times	3 (0.8)

Regarding the levels of adherence, 60.5% of the patients had low adherence and 39.5% of them had medium adherence, while none of them had high adherence as shown in figure 1.

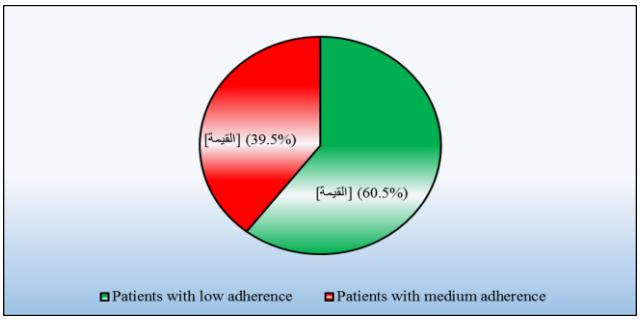

Figure 1: Levels of adherence among patients.

There were a significant association between the levels of adherence and age (P-value=0.005), sex (P-value<0.001), residency (P-value=0.010), educational level (P-value=0.001), and occupation (P-value=0.001) as shown in table 3.

Table 3: Association between sociodemographic characteristics and levels of adherence.

Sociodemographic characteristics		**Low adherence N (%)**	**Medium adherence N (%)**	**P-value**
Age group (years)	60-65	164 (55.8)	130 (44.2)	0.005
	66-70	20 (71.4)	8 (28.6)	
	>70	58 (74.4)	20 (25.6)	
Sex	Male	82 (48.2)	88 (51.8)	<0.001
	Female	160 (69.6)	70 (30.4)	
Residency	Urban	232 (59.5)	158 (40.5)	0.010
	Rural	10 (100.0)	0 (0.0)	

Marital state	Married	148 (60.2)	98 (38.8)	0.136
	Unmarried	6 (100.0)	0 (0.0)	
	Divorced or widow	88 (59.5)	60 (40.5)	
Educational level	Illiterate	54 (52.9)	48 (47.1)	0.001
	Primary school	72 (49.3)	74 (50.7)	
	Secondary school	46 (59.0)	32 (41.0)	
	College or higher	70 (94.6)	4 (5.4)	
Occupation	Unemployed	112 (58.9)	78 (41.1)	0.001
	Employed	51 (46.8)	58 (53.2)	
	Retired	79 (78.2)	22 (21.8)	

The proportion of patients with low adherence was significantly higher among patients without family history of T2DM (P-value=0.007), patients with history of other chronic diseases (P-value=0.015), increased frequency of medications per day (P-value=0.029), as shown in table 4.

Table 4: Association between sociodemographic characteristics and levels of adherence.

Medical characteristics		Low adherence N (%)	Medium adherence N (%)	P-value
Family history of T2DM	Yes	189 (57.4)	140 (42.6)	0.007
	No	53 (74.6)	18 (25.4)	
Patients had other chronic diseases	Yes	227 (62.4)	137 (37.6)	0.015
	No	15 (41.7)	21 (58.3)	
Number of diabetic medications	1	22 (68.8)	10 (313)	0.101
	2	112 (64.4)	62 (35.6)	
	3	92 (58.2)	66 (41.8)	
	4	16 (44.4)	20 (55.6)	
Number of all medications	1-4	126 (63.6)	72 (36.4)	0.204
	>4	116 (57.4)	86 (42.6)	
Frequency of medications per day	Once	15 (40.5)	22 (59.5)	0.029
	Twice	23 (57.5)	17 (42.5)	
	Three times	201 (62.8)	119 (37.2)	
	Four times	3 (100.0)	0 (0.0)	

DISCUSSION

Medications are critical in managing symptoms and avoiding complications associated with diabetes. Furthermore, medication adherence is critical for enhancing disease management and avoiding associated health complications.[21] This was one of several studies that attempted to examine diabetes medication adherence in older individuals as well as the factors that influence it. In the current study, roughly two-thirds of the patients had medium adherence, the rest had low adherence, and none had high adherence. In comparison, most patients had fair adherence in another study that was ne by Fatemeh et al. in Iran[22], 47.7% of patients had low adherence in Brazil as revealed by Rinaldo et al[23], 14.3% of patients had low adherence, whereas 34.0% medium adherence and 51.7% had high adherence in the United Kingdome as revealed by Marie et al[24], 42.8% of patients reported low medication adherence in Bangladesh as revealed by Sheikh et al[25], while the prevalence of self-reported me In the current study, age beyond 70 years was related with a substantial decline in adherence. In contrast, Rinaldo et al.'s study in Brazil found that increasing age was related with increased adherence.[23] Female patients in the current research had lesser adherence than males. The similar findings were observed in another study conducted by Iwona et al. in Poland.[26] In contrast, another study conducted by Nobuyuki Japan[27] found that adherence among senior diabetes patients was unrelated to gender. This age and gender diversity might be connected to attitudinal and behavioural variation. In the current study, rural living was related with poorer adherence rates. College or higher education and retirement were related with a substantial drop in adherence. In contrast, no significant connection was found between education and adherence in China[28], while another study conducted by Fatemeh et al. in Iran indicated that uneducated patients had weaker adherence than others.[22] This variation between studies could be attributed to the effect of other influencing factors, whereas low adherence among higher educated patients in the current study could be attributed to relying on oneself to assess their conditions without consulting a doctor or other cognitive sources, which may be incorrect. The recent study found that patients without a family history had lower levels of adherence. This was consistent with the findings of another study conducted by Sheikh et al. in Bangladesh.[25] This might be connected to patient understanding and the importance of group treatment in families when several people have the same condition. In the current study, the history of other chronic conditions had a substantial influence on adherence. Rinaldo et al. in Brazil reported similar findings.[23] The current study found that increasing the number of drugs taken per day

was substantially related with decreased treatment adherence. In the same vein, Sathma Upamali and Sarath Rathnayake determined that frequent dosage results in nonadherence. As a result, it is suggested that elderly persons with uncontrolled type 2 diabetes reduce their dose frequency or use sustained-release pills whenever possible.[21] This matched with the findings of another study conducted in Brazil by Rinaldo et al.[23]

CONCLUSION

All patients exhibited low to moderate levels of adherence, with none demonstrating high adherence. Factors associated with lower adherence include being over the age of 70, female gender, residing in a rural area, possessing a higher level of education, being retired, having no history of Type 2 Diabetes Mellitus (T2DM), a history of other chronic diseases, and an increased frequency of daily medication doses.

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