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ASSESSMENT OF MEDICATION ADHERENCE AND ITS ASSOCIATION WITH GLYCEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Medication adherence is a critical determinant of successful management of Type 2 Diabetes Mellitus (T2DM). Poor adherence to antidiabetic therapy may contribute to inadequate glycaemic control and an increased risk of diabetes-related complications.

Aims: This study assessed medication adherence and its association with glycaemic control among patients with T2DM.

Materials and Methods: This hospital-based cross-sectional study included 150 adult patients with T2DM attending the Department of General Medicine, Prakash Institute of Medical Sciences, UranIslampur, from 1 January 2026 to 28 February 2026. Patients aged ≥18 years who had been receiving antidiabetic treatment for at least six months were included. Demographic, socioeconomic, clinical, lifestyle, treatment-related, and laboratory data were collected. Medication adherence was categorised as high, medium, or low using a validated adherence assessment tool. Glycaemic control was assessed using HbA1c. Statistical significance was considered at $p<0.05$.

Results: Among 150 participants, 28.0% had high medication adherence, 40.7% had medium adherence, and 31.3% had low adherence. Good glycaemic control (HbA1c <7%) was achieved by 69.0% of highly adherent patients, compared with 34.4% and 14.9% of patients with medium and low adherence, respectively. Mean HbA1c increased progressively from 6.8±0.7% in the high-adherence group to 7.8±1.0% and 9.1±1.3% in the medium- and low-adherence groups, respectively ($p<0.001$). Poor adherence was significantly associated with older age, lower educational and socioeconomic status, longer diabetes duration, polypharmacy, insulin use, and physical inactivity.

Conclusion: Suboptimal medication adherence was common and significantly associated with poor glycaemic control. Routine assessment of adherence and targeted patient-centred interventions may improve long-term diabetes outcomes.

Keywords: Type 2 Diabetes Mellitus; Medication Adherence; Glycaemic Control; HbA1c; Antidiabetic Therapy; Polypharmacy.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is one of the most important chronic non-communicable diseases worldwide and represents a rapidly growing public health challenge. The global burden of diabetes has increased substantially over recent decades, driven by population ageing, urbanisation, sedentary lifestyles, obesity, and changes in dietary patterns.[1] Recent estimates indicate that hundreds of millions of adults are living with diabetes worldwide, with a disproportionate increase occurring in low- and

middle-income countries.[2] India bears a particularly large burden of T2DM, making effective long-term disease management an important clinical and public health priority.[3]

The management of T2DM requires a comprehensive approach involving lifestyle modification, regular monitoring, and sustained use of glucose-lowering medications. The primary goal of treatment is to achieve and maintain adequate glycaemic control while reducing the risk of acute and chronic complications. Glycated haemoglobin (HbA1c) is widely used to assess long-term glycaemic status because it reflects average blood glucose levels over the preceding two to three months.[4] Persistent poor glycaemic control is associated with an increased risk of microvascular and macrovascular complications, including diabetic retinopathy, nephropathy, neuropathy, cardiovascular disease, and stroke. Therefore, achieving appropriate glycaemic targets is essential for improving long-term outcomes in patients with T2DM.[4,5]

Despite the availability of effective glucose-lowering therapies, optimal glycaemic control remains difficult to achieve in a substantial proportion of patients. One of the major modifiable factors contributing to inadequate treatment outcomes is poor medication adherence. Medication adherence refers to the extent to which a patient takes prescribed medicines in accordance with the agreed treatment regimen. In T2DM, treatment is usually lifelong and may involve multiple medications, frequent dosing, insulin administration, and simultaneous management of associated conditions such as hypertension and dyslipidaemia. These requirements can create a considerable treatment burden and may adversely affect adherence.[6]

Evidence suggests that suboptimal adherence to antidiabetic medication is common and is associated with poorer glycaemic control. Patients with lower adherence frequently demonstrate higher HbA1c levels and may consequently be at greater risk of diabetes-related complications, hospitalisation, and increased healthcare utilisation.[5,7] However, medication-taking behaviour is complex and may be influenced by several demographic, socioeconomic, clinical, and treatment-related factors. Forgetfulness, lower educational status, financial constraints, fear of adverse effects, lack of disease-related knowledge, complex treatment regimens, polypharmacy, longer duration of disease, and inadequate social or healthcare support have all been associated with poor adherence.[6,8]

Assessment of medication adherence in routine clinical practice can therefore help identify patients who may benefit from targeted counselling and treatment-related interventions. Validated self-report adherence instruments provide a practical method for evaluating medication-taking behaviour in hospital-based settings, although the choice of instrument should consider validity, feasibility, and licensing requirements.[9] Recent evidence from India also indicates that suboptimal adherence to antidiabetic medication remains an important concern, reinforcing the need for context-specific evaluation of adherence and its determinants.[10]

The present study aims to assess medication adherence among patients with Type 2 Diabetes Mellitus and to determine its association with glycaemic control, particularly HbA1c levels. The study also seeks to identify demographic, socioeconomic, clinical, and treatment-related factors associated with poor medication adherence, thereby providing insights that may help improve adherence and optimise long-term glycaemic outcomes.

MATERIALS AND METHODS

Study Design: Hospital-based cross-sectional study.
Study Population: Adult patients diagnosed with Type 2 Diabetes Mellitus and attending the Department of General Medicine during the study period.
Sample Size: A total of 150 patients.
Study Duration: Two months, from 1 January 2026 to 28 February 2026.
Study Place: Department of General Medicine, Prakash Institute of Medical Sciences, UranIslampur.

Inclusion Criteria:
- Patients aged ≥18 years.
- Patients diagnosed with Type 2 Diabetes Mellitus.
- Patients receiving antidiabetic treatment for at least 6 months.
- Patients willing to participate and provide informed consent.

Exclusion Criteria:
- Patients with Type 1 Diabetes Mellitus.
- Patients with gestational diabetes mellitus.
- Seriously or critically ill patients.
- Patients with cognitive impairment affecting their ability to respond reliably to the study questionnaire.

Statistical Analysis: The collected data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Associations between categorical variables, including demographic characteristics, clinical and lifestyle factors, treatment profile, medication adherence status, glycaemic control, and diabetes-related complications, were assessed using the Chi-square test, with Fisher's exact test applied for contingency tables containing expected cell frequencies below five. Differences in mean HbA1c

levels among the high, medium, and low medication adherence groups were compared using one-way analysis of variance (ANOVA), followed by post-hoc analysis for pairwise group comparisons wherever statistically indicated. All statistical tests were two-tailed, and a p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic and Socioeconomic Characteristics of the Study Participants

Variable	Category	Number of Patients	Percentage (%)	P-value
Age Group (years)	<40	12	8	0.018
	41–50	29	19.3	
	51–60	48	32	
	61–70	39	26	
	>70	22	14.7	
Sex	Male	86	57.3	0.073
	Female	64	42.7	
Education	Illiterate	21	14	0.031
	Primary	38	25.3	
	Secondary	47	31.3	
	Graduate and above	44	29.3	
Occupation	Employed	52	34.7	0.084
	Self-employed	36	24	
	Homemaker	38	25.3	
	Retired/Unemployed	24	16	
Monthly Income (□)	<10,000	35	23.3	0.042
	10,000–25,000	58	38.7	
	>25,000	57	38	

Table 2: Clinical and Lifestyle Characteristics of the Study Participants

Variable	Category	Number of Patients	Percentage (%)	P-value
Duration of Diabetes	<5 years	48	32	0.027
	5–10 years	61	40.7	
	>10 years	41	27.3	
BMI (kg/m²)	Normal (<25)	45	30	0.039
	Overweight (25–29.9)	67	44.7	
	Obese (≥30)	38	25.3	
Hypertension	Present	92	61.3	0.006
	Absent	58	38.7	
Smoking	Yes	43	28.7	0.112
	No	107	71.3	
Alcohol Consumption	Yes	37	24.7	0.164
	No	113	75.3	
Regular Exercise	Yes	59	39.3	0.021
	No	91	60.7	

Table 3: Treatment Profile and Medication Adherence Among Study Participants

Variable	Category	Number of Patients	Percentage (%)	P-value
Treatment Type	Oral antidiabetic drugs only	96	64	0.014
	Insulin only	18	12	
	Oral drugs + Insulin	36	24	
Number of Daily Medications	1–2	67	44.7	0.008
	3–4	56	37.3	
	≥5	27	18	
Medication Adherence	High	42	28	<0.001
	Medium	61	40.7	
	Low	47	31.3	

Table 4: Association Between Medication Adherence and Glycaemic Control

Medication Adherence	HbA1c <7% n (%)	HbA1c ≥7% n (%)	Total n (%)	Mean HbA1c (%)	P-value
High	29 (69.0)	13 (31.0)	42 (28.0)	6.8 ± 0.7	<0.001
Medium	21 (34.4)	40 (65.6)	61 (40.7)	7.8 ± 1.0	
Low	7 (14.9)	40 (85.1)	47 (31.3)	9.1 ± 1.3	
Total	57 (38.0)	93 (62.0)	150 (100.0)	8.0 ± 1.4	

Table 5: Factors Associated with Poor Medication Adherence

Factor	Poor Adherence n/N (%)	Adequate Adherence n/N (%)	P-value
Age >60 years	27/61 (44.3)	34/61 (55.7)	0.012
Lower educational status	25/59 (42.4)	34/59 (57.6)	0.021
Monthly income <□10,000	16/35 (45.7)	19/35 (54.3)	0.038

Diabetes duration >10 years	18/41 (43.9)	23/41 (56.1)	0.029
≥5 daily medications	15/27 (55.6)	12/27 (44.4)	0.003
Insulin use	23/54 (42.6)	31/54 (57.4)	0.017
No regular exercise	35/91 (38.5)	56/91 (61.5)	0.026

Table 6: Diabetes-Related Complications According to Medication Adherence

Complication	High Adherence n (%)	Medium Adherence n (%)	Low Adherence n (%)	P-value
Neuropathy	6 (14.3)	15 (24.6)	19 (40.4)	0.009
Retinopathy	4 (9.5)	11 (18.0)	15 (31.9)	0.015
Nephropathy	3 (7.1)	8 (13.1)	12 (25.5)	0.028
Coronary artery disease	5 (11.9)	10 (16.4)	13 (27.7)	0.084
Stroke	1 (2.4)	3 (4.9)	5 (10.6)	0.213

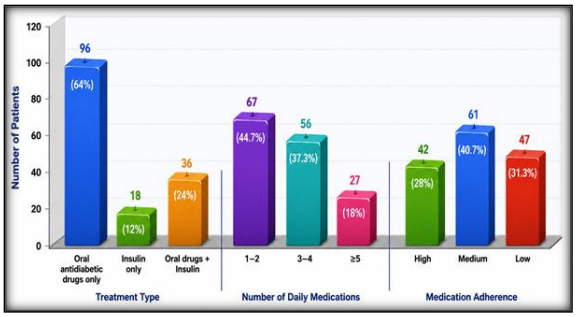

Figure 1: Treatment, Medication Burden, and Adherence

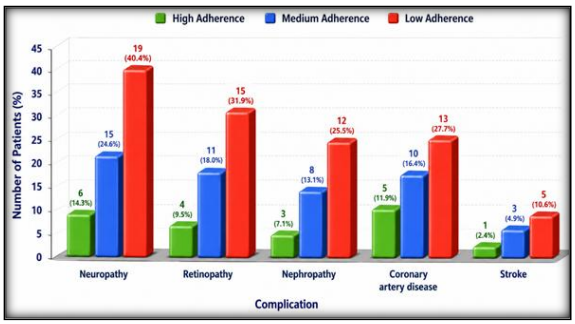

Figure 2: Diabetes-Related Complications According to Medication Adherence

A total of 150 patients with Type 2 Diabetes Mellitus were included in the study. The findings regarding demographic characteristics, clinical and lifestyle profiles, treatment patterns, medication adherence, glycaemic control, factors associated with poor adherence, and diabetes-related complications are presented below.

Among the 150 study participants, the largest proportion belonged to the 51–60-year age group (32.0%), followed by 61–70 years (26.0%), 41–50 years (19.3%), >70 years (14.7%), and <40 years (8.0%). The distribution across age groups was statistically significant (p=0.018). Males constituted 57.3% of the participants, while females accounted for 42.7% (p=0.073). Regarding educational status, 31.3% had secondary-level education, 29.3% were graduates or above, 25.3% had primary education, and 14.0% were illiterate, with a statistically significant distribution (p=0.031). In terms of occupation, 34.7% were employed, 25.3% were homemakers, 24.0% were self-employed, and 16.0% were retired or unemployed (p=0.084). Monthly income was <□10,000 in 23.3% of participants, □10,000–25,000 in 38.7%, and >□25,000 in 38.0%, showing a statistically significant distribution (p=0.042).

The duration of diabetes was 5–10 years in the largest proportion of patients (40.7%), while 32.0% had diabetes for <5 years and 27.3% for >10 years (p=0.027). Based on BMI, 44.7% of participants were overweight, 25.3% were obese, and 30.0% had a normal BMI, with the distribution being statistically significant (p=0.039). Hypertension was present in 92 patients (61.3%) and absent in 58 (38.7%), showing a significant difference (p=0.006). Smoking was reported by 28.7% of patients, whereas 71.3% were non-smokers (p=0.112). Alcohol consumption was reported by 24.7% of participants, while 75.3% did not consume alcohol (p=0.164). Regular exercise was reported by only 39.3% of patients, whereas 60.7% did not exercise regularly, with a statistically significant difference (p=0.021).

Regarding the treatment pattern, 96 patients (64.0%) were receiving oral antidiabetic drugs alone, 18 (12.0%) were receiving insulin alone, and 36 (24.0%) were receiving a combination of oral antidiabetic drugs and insulin (p=0.014). With respect to medication burden, 44.7% of patients were taking 1–2 medications daily, 37.3% were taking 3–4 medications, and 18.0% were taking five or more medications (p=0.008). Assessment of medication adherence showed that 42 patients (28.0%) had high adherence, 61 (40.7%) had medium adherence, and 47 (31.3%) had low adherence. The distribution of medication adherence levels was statistically significant (p<0.001), indicating that a considerable proportion of the study population had suboptimal medication adherence.

A strong association was observed between medication adherence and glycaemic control. Among patients with high medication adherence, 29 of 42 patients (69.0%) had good glycaemic control with HbA1c <7%, whereas only 13 (31.0%) had HbA1c ≥7%. In the medium-adherence group, 21 of 61 patients (34.4%) achieved HbA1c <7%, while 40 (65.6%) had HbA1c ≥7%. Among patients with low adherence, only 7 of 47 patients (14.9%) achieved HbA1c <7%, whereas 40 (85.1%) had poor glycaemic control with HbA1c ≥7%. Mean HbA1c progressively increased from 6.8±0.7% in the high-adherence group to 7.8±1.0% in the medium-adherence group and 9.1±1.3% in the low-adherence

group. Overall, 57 patients (38.0%) had HbA1c <7%, while 93 (62.0%) had HbA1c ≥7%. The association between medication adherence and glycaemic control was highly statistically significant (p<0.001).

Several demographic, socioeconomic, and treatment-related factors were significantly associated with poor medication adherence. Among patients aged >60 years, 27 of 61 (44.3%) had poor adherence (p=0.012). Poor adherence was observed in 25 of 59 patients (42.4%) with lower educational status (p=0.021) and in 16 of 35 patients (45.7%) with a monthly income below □10,000 (p=0.038). Among patients with diabetes for more than 10 years, 18 of 41 (43.9%) demonstrated poor adherence (p=0.029). The highest proportion of poor adherence was observed among patients taking five or more medications daily, with 15 of 27 patients (55.6%) classified as poorly adherent (p=0.003). Poor adherence was also found in 23 of 54 insulin users (42.6%; p=0.017) and 35 of 91 patients who did not exercise regularly (38.5%; p=0.026). These findings indicate that older age, lower educational and socioeconomic status, longer disease duration, polypharmacy, insulin use, and physical inactivity were significantly associated with poor medication adherence.

The prevalence of several diabetes-related complications increased with decreasing medication adherence. Neuropathy was present in 14.3% of patients with high adherence, 24.6% with medium adherence, and 40.4% with low adherence, showing a statistically significant association (p=0.009). Similarly, retinopathy was observed in 9.5%, 18.0%, and 31.9% of patients in the high-, medium-, and low-adherence groups, respectively (p=0.015). Nephropathy was present in 7.1% of highly adherent patients, 13.1% of moderately adherent patients, and 25.5% of patients with low adherence (p=0.028). Coronary artery disease was more frequent among patients with low adherence (27.7%) than among those with medium (16.4%) or high adherence (11.9%), although the association did not reach statistical significance (p=0.084). Stroke was also more common in the low-adherence group (10.6%) compared with the medium- (4.9%) and high-adherence groups (2.4%); however, this association was not statistically significant (p=0.213). Overall, poorer medication adherence was associated with a greater burden of microvascular complications, particularly neuropathy, retinopathy, and nephropathy.

DISCUSSION

The present hospital-based cross-sectional study assessed medication adherence and its relationship with glycaemic control among 150 patients with Type 2 Diabetes Mellitus. The findings demonstrated a substantial burden of suboptimal medication adherence, with only 28.0% of patients showing high adherence, while 40.7% had medium adherence and 31.3% had low adherence. Most importantly, medication adherence showed a strong association with glycaemic control. Patients with low adherence had markedly higher HbA1c levels and a greater burden of selected microvascular complications. Several demographics, socioeconomic, clinical, and treatment-related factors were also associated with poor adherence.

In the present study, the largest proportion of participants belonged to the age group of 51–60 years (32.0%), followed by 61–70 years (26.0%). Overall, 40.7% of patients were older than 60 years, indicating that T2DM predominantly affected middle-aged and older adults in the study population. Males constituted 57.3% of the participants, while females accounted for 42.7%. Similar demographic patterns have been reported in hospital-based studies of patients with T2DM, where middle-aged and older adults represented a substantial proportion of the study population. Sharma et al., in a cross-sectional study involving patients with T2DM attending a tertiary care hospital in North India, also demonstrated that medication-taking behaviour was influenced by patient-related and sociodemographic characteristics.[11]

Educational and socioeconomic differences were also evident in the present study. Approximately 39.3% of participants were either illiterate or educated only up to the primary level, while 23.3% had a monthly income below □10,000. Lower educational status and lower income were subsequently found to be significantly associated with poor medication adherence. These observations are clinically relevant because limited health literacy may affect patients' understanding of diabetes, the importance of regular medication use, and the consequences of missed doses. Similarly, financial constraints may interfere with the continuous purchase of medicines, investigations, and regular follow-up. Gow et al., in a qualitative systematic review, highlighted that medication adherence in diabetes is influenced by knowledge, beliefs, social support, healthcare accessibility, and practical barriers encountered in daily life.[12] Thus, adherence should be understood as a multidimensional behaviour rather than merely a patient's willingness to take medication.

Regarding the clinical profile, 40.7% of patients had diabetes for 5–10 years and 27.3% had the disease for more than 10 years. Overweight and obesity were common, affecting 44.7% and 25.3% of patients, respectively. Hypertension was present in 61.3% of participants. These findings indicate a considerable cardiometabolic burden among the study population. The coexistence of obesity, hypertension, and long-standing diabetes can increase treatment complexity and may require multiple medications, thereby making long-term disease management more challenging.

Regular physical exercise was reported by only 39.3% of participants, whereas 60.7% did not

exercise regularly. This finding suggests that inadequate lifestyle modification remained common despite established diabetes. Chin et al. reported that medication adherence and glycaemic control in patients with T2DM are influenced by multiple interacting factors and emphasised that pharmacological adherence alone may not fully explain metabolic outcomes.[13] Similarly, Suprapti et al. demonstrated that glycaemic control among patients with T2DM is affected by both medication-related and patient-related factors.[14] Therefore, comprehensive diabetes management should combine regular medication use with physical activity, dietary modification, weight management, and continuous patient education.

In the present study, 64.0% of patients were receiving oral antidiabetic drugs alone, 12.0% were receiving insulin alone, and 24.0% were receiving a combination of oral agents and insulin. Regarding medication burden, 44.7% were taking one to two medications daily, while 18.0% were taking five or more medications. Only 28.0% of the participants demonstrated high medication adherence; 40.7% had medium adherence and 31.3% had low adherence. Thus, nearly three-fourths of the study population had less than high adherence.

The observed burden of suboptimal adherence is consistent with recent literature showing that adherence to long-term antidiabetic therapy remains a major challenge. Hadush et al. reported poor medication adherence in 44.6% of patients with T2DM and also observed a high prevalence of suboptimal glycaemic control.[15] Al-Salmi et al., in a qualitative meta-synthesis, further demonstrated that adherence is shaped by treatment burden, medication-related concerns, patient knowledge, beliefs, family support, and healthcare-system factors.[16] Differences in the exact prevalence of adherence between studies may arise from variations in adherence assessment tools, patient populations, healthcare settings, treatment regimens, and definitions of adherence.

The principal finding of the present study was the strong relationship between medication adherence and glycaemic control. Among patients with high adherence, 69.0% achieved HbA1c <7%, compared with 34.4% in the medium-adherence group and only 14.9% in the low-adherence group. Conversely, poor glycaemic control with HbA1c ≥7% was observed in 85.1% of patients with low adherence. Mean HbA1c also showed a clear increasing trend, from 6.8±0.7% among highly adherent patients to 7.8±1.0% among those with medium adherence and 9.1±1.3% among those with low adherence. The association was highly statistically significant ($p<0.001$).

These findings strongly support the clinical importance of consistent medication use in achieving glycaemic targets. Suprapti et al. similarly reported an important relationship between adherence and glycaemic outcomes among patients with T2DM.[14]Hadush et al. also observed that poor adherence occurred alongside a high burden of inadequate glycaemic control.[15] More recently, Nascimento et al. emphasised that medication adherence is an important component of glycaemic management, although adequate adherence alone may not guarantee optimal metabolic control because diet, physical activity, disease severity, and treatment appropriateness also contribute to HbA1c outcomes.[17] Therefore, the present findings suggest that medication adherence represents an important and potentially modifiable determinant of glycaemic control, while recognising that the relationship is multifactorial.

Several factors were significantly associated with poor medication adherence in the present study. Poor adherence was observed in 44.3% of patients aged >60 years, 42.4% of those with lower educational status, and 45.7% of patients with a monthly income below □10,000. In addition, 43.9% of patients with diabetes for more than 10 years had poor adherence. The strongest treatment-related association was observed among patients taking five or more medications daily, of whom 55.6% had poor adherence ($p=0.003$). Poor adherence was also more frequent among insulin users (42.6%) and patients who did not exercise regularly (38.5%).

These findings are comparable with the broader evidence that medication adherence is influenced by a combination of patient, disease, treatment, and healthcare-related factors. Sharma et al. identified important predictors of medication adherence among Indian patients with T2DM, supporting the need to recognise patient-specific barriers during routine clinical care.[11]Gow et al. similarly identified knowledge, beliefs, support systems, and treatment-related difficulties as major influences on adherence.[12]Kwakye et al. further reported that demographic characteristics, including age and educational level, can influence medication adherence among patients with diabetes and comorbid conditions.[18]

The association between polypharmacy and poor adherence observed in the present study is particularly important. Patients taking multiple medicines may experience complex dosing schedules, pill burden, adverse effects, and difficulty remembering individual medications. Highton et al. emphasised the continuing clinical importance of improving medication adherence in T2DM and the need for interventions that address the multiple causes of non-adherence.[19] Simplification of treatment regimens, medication reconciliation, clear counselling, reminder systems, and regular assessment of adherence may therefore be useful, particularly for older patients and those receiving multiple medications.

The prevalence of microvascular complications increased progressively as medication adherence decreased. Neuropathy was observed in 14.3% of patients with high adherence, 24.6% with medium adherence, and 40.4% with low adherence ($p=0.009$). Similarly, retinopathy increased from

9.5% in the high-adherence group to 31.9% in the low-adherence group (p=0.015), while nephropathy increased from 7.1% to 25.5% (p=0.028). Coronary artery disease and stroke were also numerically more frequent among patients with low adherence, although these associations were not statistically significant.

A plausible explanation for these findings is that persistent non-adherence may contribute to prolonged hyperglycaemia, which in turn increases the risk of diabetes-related vascular damage. However, because the present study was cross-sectional, a temporal or causal relationship between poor adherence and complications cannot be established. Patients with complications may also have longer disease duration, greater treatment complexity, and a higher medication burden, all of which may themselves influence adherence. Recent evidence continues to emphasise that improving adherence is an important component of reducing adverse outcomes and healthcare utilisation in T2DM.[19]Basu et al., in a recent systematic review and meta-analysis focused on Indian patients with T2DM, also highlighted the substantial burden and multifactorial determinants of suboptimal medication adherence in India.[20]

Overall, the present study demonstrates that suboptimal medication adherence is common among patients with T2DM and is strongly associated with poor glycaemic control. Lower educational and socioeconomic status, older age, longer duration of diabetes, polypharmacy, insulin use, and physical inactivity were important correlates of poor adherence. The progressive increase in mean HbA1c and microvascular complications across decreasing adherence categories further highlights the clinical relevance of medication-taking behaviour. Routine assessment of adherence, identification of individual barriers, simplification of treatment regimens where feasible, and sustained patient-centred counselling may contribute to better long-term diabetes management.

CONCLUSION

The present study demonstrated that suboptimal medication adherence is common among patients with Type 2 Diabetes Mellitus and is significantly associated with poor glycaemic control. Patients with low medication adherence had substantially higher mean HbA1c levels and were less likely to achieve recommended glycaemic targets compared with those with high adherence. Older age, lower educational and socioeconomic status, longer duration of diabetes, polypharmacy, insulin use, and lack of regular physical activity were important factors associated with poor adherence. Furthermore, microvascular complications, particularly neuropathy, retinopathy, and nephropathy, were more frequent among patients with lower medication adherence. These findings highlight the importance of routinely assessing medication adherence as an integral component of diabetes management. Individualised patient education, simplification of treatment regimens where feasible, regular counselling, and identification of socioeconomic and treatment-related barriers may improve adherence and glycaemic outcomes. A patient-centred, multidisciplinary approach is therefore essential for optimising long-term diabetes care and reducing the burden of preventable complications.

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