VIA MEDICA
RESEARCH PAPER
ISSN 2450–7458
e-ISSN 2450–8187

Samsuj Joha[1], Amar Kumar Gupta[1], Shatavisa Mukherjee[2], Nikhil Era[1]
[1]Department of Pharmacology, MGM Medical College and Hospital, Kishanganj, Bihar, India
[2]Department of Clinical and Experimental Pharmacology, School of Tropical Medicine, Kolkata, West Bengal, India

Medication Adherence and Quality of Life Among Type 2 Diabetes Patients: A Cross-Sectional, Observational Study in an Eastern India Set Up

ABSTRACT

Objective: This study aimed to assess medication adherence and its association with quality of life (QoL) in type 2 diabetes (T2D) patients.

Materials and methods: This cross-sectional study included 374 T2D patients aged 18–75 years, receiving treatment for at least six months. Medication adherence was evaluated using the Medication Adherence Rating Scale (MARS), and QoL was assessed using the WHO-QoL-BREF instrument. Data were analyzed using descriptive statistics and multiple regression to identify predictors of adherence and QoL.

Results: The study reports a mean age of 55.69 years, with a male preponderance (59.89%). Sixty-one per cent exhibited low adherence scores (MARS 0–5), with a mean adherence score of 6.98. Higher adherence was significantly associated with improved fasting plasma glucose and postprandial glucose levels, although HbA1c levels were similar across adherence groups. QoL scores were highest in the physical, psychological, and social domains for patients with better adherence. Multiple regression analysis identified adherence as an independent predictor of QoL ($p < 0.05$) after adjusting for sociodemographic and clinical variables.

Conclusions: This study highlights the critical link between medication adherence and improved QoL in T2D patients. Interventions targeting adherence barriers, particularly in rural populations, can enhance glycemic outcomes and QoL, underscoring the importance of patient-centered strategies in diabetes care.

Keywords: type 2 diabetes, medication adherence, quality of life, glycemic control, WHO-QoL-BREF

Introduction

Type 2 diabetes (T2D), a chronic and progressive metabolic disorder, presents a significant public health challenge globally [1]. Managing this condition requires lifelong drug therapy, lifestyle modifications, and adherence to prescribed treatment regimens. Despite advancements in medical interventions, poor adherence to treatment, and suboptimal lifestyle, habits remain key barriers to effective disease management [2]. The primary goal of diabetes care is not only glycemic control but also improvement of the patient's health-related quality of life (QoL), an emerging and

Address for correspondence:
Shatavisa Mukherjee
Department of Clinical and Experimental Pharmacology, School of Tropical Medicine, Kolkata, West Bengal, India
E-mail: shatavisa100@gmail.com
Clinical Diabetology
DOI: 10.5603/cd.104255
Received: 29.12.2024 Accepted: 9.02.2025
Early publication date: 28.02.2025

vital outcome for chronic disease management [3]. Beyond its fatal outcomes, the disease imposes a substantial burden on physical and mental health through complications such as vascular diseases, musculoskeletal disorders, and limitations in daily activities [4, 5].

Medication adherence refers to the extent to which a patient's behavior aligns with healthcare providers' recommendations. The World Health Organization (WHO) states that improving adherence has a far greater impact on public health outcomes than any specific medical treatment. Poor adherence is associated with adverse health outcomes, increased mortality, and higher healthcare costs [6]. The U.S., for instance, incurs $100 billion annually in preventable costs due to nonadherence, along with 125,000 avoidable deaths [7].

QoL is a critical metric in chronic disease management because it provides a holistic understanding of the patient's overall well-being, encompassing physical, psychological, and social dimensions. Unlike traditional clinical outcomes such as glycemic control or blood pressure levels, QoL reflects the broader impact of the disease and its treatment on the patient's day-to-day life. It helps healthcare providers identify specific areas of concern, guiding interventions that are not only medically effective but also personally meaningful to the patient. For chronic conditions like T2D, where lifelong management is necessary, prioritizing QoL can enhance patient engagement, adherence, and overall outcomes.

Globally, adherence to diabetes is suboptimal. While approximately 50% of patients in developed countries adhere to their prescribed regimens, the rates are even lower in developing nations. Factors influencing non-adherence include complex financial constraints, lack of health literacy, and psychosocial challenges [8]. A study in India highlighted that affordability and limited access to healthcare significantly impact adherence rates, especially in rural populations [9].

Achieving glycemic control is fundamental to preventing diabetes-related complications. Evidence demonstrates that higher medication adherence is directly associated with better glycemic outcomes, including lower fasting plasma glucose (FPG) and glycated hemoglobin (HbA1c) levels [10]. A study in India reported that patients with higher adherence showed significant improvement in glycemic markers compared to non-adherent patients [11]. Similarly, studies have established that improved glycemic control reduces the risk of both microvascular and macrovascular complications [12]. Despite these findings, adherence remains a global challenge. This study is envisaged to assess adherence to antidiabetic medications and QoL in patients with T2D attending the outpatient department of a tertiary care hospital.

Materials and methods

Study design

This was a cross-sectional descriptive observational study, conducted over two years in a tertiary care hospital in eastern India.

Study population

The study included patients of either gender aged between 18 and 75 years, diagnosed with T2D and receiving treatment for over 6 months, and willing to take part in the study. Those receiving antidiabetic treatment for less than 6 months and those with cognitive or neurological impairment were excluded.

A sample size of 350 was calculated considering that an estimated 31.2% [13] of the population was nonadherent to antidiabetic medications, a margin of error of 5% with a 95% confidence interval (CI), a 10% study dropout rate, and entering potential confounders as covariates in the regression model.

Ethical approval

Permission for the conduct of the study was obtained from the Institutional Ethics Committee with Approval No. IEC-MGMMC/2022-03/17. Written informed consent was obtained from all participants, and the study adhered to the guidelines of the Declaration of Helsinki.

Data collection

After obtaining the written informed consent, the relevant data were collected with a structured interview questionnaire that included sociodemographic characteristics and glycemic indices (section I), the Medication Adherence Rating Scale [14] (MARS, section II), and the WHO-QoL-BREF scale [15] (section III). MARS [14] is a 10-item questionnaire with acceptable validity that was originally developed in English. To avoid acquiescence bias, the items in the scale have a dichotomous response (yes/no). The minimum score is 0 and the maximum score is 10. The summed total score is categorized as non- or poor adherence (0–5) or adherence or good adherence (6–10) [10]. The WHO QoL-BREF is a generic instrument developed to measure the QoL of patients suffering from T2D according to the WHO criteria; it is a short version of the 100-item WHOQoL-100. Both these instruments have validated translations that were used for the study.

Statistical analysis

Data were coded and entered into Microsoft Excel worksheets. Descriptive and inferential statistics (if required) were used for data analysis. Sociodemographic characteristics were reported as frequencies

and percentages. Adherence to anti-diabetic medication- and health-related QoL was reported as means and standard deviation. Multiple linear regression analysis was performed to assess the effect of adherence to antidiabetic medication within each QoL domain after adjusting the estimates for some sociodemographic variables. A p-value < 0.05 was considered statistically significant. The Statistical Package for the Social Sciences (SPSS 21.0) was used for statistical analysis.

Results

The study included a total of 374 T2D patients with a mean age of 55.69 years with a standard deviation of 10.95 years, ranging from 46 to 84 years. The majority — 59.89% (n = 224) — of patients were male. The study had 44.91% rural presentation (n = 168). Major comorbidities noted were hypertension, hyperlipidemia, hypothyroidism, chronic obstructive pulmonary disease, asthma, and osteoarthritis. Around 58% of patients were diagnosed with T2D in the last 1–5 years, while 23% of patients had had T2D for the last 5–10 years, and 19% had had T2D for over 10 years. As per the antidiabetic treatment history, 51% were taking both insulin and oral hypoglycemic agents (OHAs) for treatment along with lifestyle modifications, while the rest were only on oral hypoglycemic agents with lifestyle modifications (Tab. 1). The mean FPG was 128.23 ± 21.25 mg/dL, the mean PPG was 217.26 ± 36.41 mg/dL, and the mean HbA1C% was 6.8 ± 1.87 mg/dL.

Out of 374 T2D patients included in the study, it was noted that 61% had lower adherence scores on the MARS scale, scoring between 0 and 5. The mean adherence score was noted as 6.98. Assessing for glycemic indices in these patients, it was noted that those having higher medication adherence with scores ranging from 6 to 10 had a significantly better glycemic profile in terms of lower fasting plasma glucose ($p < 0.001$) and lower postprandial plasma glucose ($p < 0.001$), as compared to those with poorer medication adherence. HbA1c was, however, similar in both types of adherent groups ($p = 0.062$).

QoL was assessed among the study subjects. The mean QoL scores for all domains of WHO-QoL BREF were assessed. Mean domain scores for physical, psychological, social, and environmental domains were 57.88, 59.91, 65.35, and 69.62, respectively. Mean QoL scores were significantly higher for domains like physical, psychological, and social for patients with better medication adherence ($p < 0.01$) (Tab. 2).

Multiple regression analysis revealed that medication adherence was an independent predictor of QoL ($p < 0.05$) after adjusting for duration of diabetes, type of antidiabetic medications, and various demographic characteristics including age, residence, education, and monthly income. Patients who had better MARS scores demonstrated significantly higher mean QoL scores ($p = 0.01$) compared to those with lower medication adherence scores.

Table 1. Baseline Patient Characteristics (N = 374)

Variables	Observations [n (%)]
Age	
< 30 years	3 (0.8%)
30–40 years	42 (11.22%)
41–50 years	99 (26.47%)
51–60 years	136 (36.36%)
61–70 years	85 (22.72%)
71–75 years	9 (2.41%)
Gender	
Male	224 (59.89%)
Residence	
Rural	168 (44.91%)
Urban	206 (55.08%)
Comorbidities	
Hypertension	196 (52.4%)
Hyperlipidemia	142 (37.96%)
Chronic obstructive pulmonary disease	129 (34.49%)
Hypothyroidism	89 (23.79%)
Asthma	56 (14.97%)
Osteoarthritis	23 (6.14%)
Duration of T2D	
1–5 years	216 (57.75%)
5–10 years	86 (22.99%)
> 10 years	72 (19.25%)
Treatment regimen	
Insulin + OHA + Lifestyle modifications	190 (50.80%)
OHA + Lifestyle modifications	184 (49.19%)

OHA — oral hypoglycemic agents; T2D — type 2 diabetes

Discussion

The study presents a comprehensive assessment of T2D patients, exploring the interplay between medication adherence, glycemic control, and QoL. These findings hold significant implications when contextualized with existing Indian and international research on T2D. Our study reports a mean age of 55.69 years, with a male preponderance (59.89%), aligning with Indian studies demonstrating a higher prevalence of T2D among males in the 40–60 age group. A study conducted in South India by Ramachandran et al. [15] found similar demographic patterns. The study

Table 2. Medication Adherence and Quality of Life

Variables	Observations [n (%)]
Mean adherence score	6.98 ± 2.71
Medication adherence category	
Low adherence [MARS score 0–5]	228 (60.96%)
High adherence [MARS score 6–10]	146 (39.03%)
Mean QoL domain score	
Physical	57.88 ± 2.36
Psychological	59.91 ± 3.65
Social	65.35 ± 2.14
Environmental	69.62 ± 1.14

MARS — Medication Adherence Rating Scale; QoL — quality of life

highlights a significant correlation between medication adherence and glycemic indices. Patients with higher adherence demonstrated better FPG and postprandial plasma glucose levels, but HbA1c remained similar between adherence groups. This finding parallels several Indian studies that reported a strong association between medication adherence and glycemic control. [11, 15–17] International studies also emphasize that poor medication adherence is a global challenge, affecting nearly 50% of T2D patients, and is a critical determinant of glycemic control. [18] The study's observation that rural populations form a significant proportion of the cohort (44.91%) adds depth to the discussion on barriers to adherence. Indian research frequently highlights challenges such as low health literacy, financial constraints, and limited access to healthcare in rural settings as key factors influencing adherence [19]. Globally, adherence patterns and influencing factors in low-income countries include polypharmacy and patient-provider communication, whereas in low- and middle-income countries, including India, structural barriers like medication costs and lack of healthcare infrastructure predominate [8, 20].

This study population's QoL, as assessed by WHO--QoL BREF, was significantly higher in patients with better adherence, which is a critical observation. The physical, psychological, and social domains of QoL were most positively impacted. Indian studies such as those by Mishra et al. [21] similarly report that medication adherence and effective glycemic control are strong predictors of improved QoL, particularly in domains related to physical health. International studies echo this trend [22, 23]. The study indicates that a majority (58%) of patients were diagnosed with T2D in the last 1–5 years, and 51% were on both insulin and OHAs. This pattern reflects the progressive nature of T2D in India, where initial management often begins with OHAs, transitioning to insulin as glycemic control becomes challenging. Internationally, treatment regimens differ slightly. While combination therapy is common worldwide, the gross use of GLP-1 receptor agonists and SGLT-2 inhibitors in high-income countries contrasts with India's reliance on older, cost-effective medications like metformin and sulfonylureas [24].

The study's use of multiple regression in identifying medication adherence as an independent predictor of QoL strengthens the argument for adherence-focused interventions. Indian studies have consistently underscored this relationship. Studies have inferred that adherence-promoting interventions like patient education significantly improved both glycemic outcomes and QoL. Globally, adherence as a QoL determinant is well documented [25].

The study underscores the critical need for adherence focuses. In the Indian context, community-based programs leveraging health workers to improve medication adherence can be particularly effective. Addressing barriers such as healthcare access and affordability in rural areas could significantly enhance adherence rates and glycemic outcomes [26]. Given the high prevalence of comorbidities, integrating diabetes management with hypertension and lipid control is essential, as emphasized by both Indian and global guidelines. Considering the diverse treatment patterns in India and abroad, personalized therapy that accounts for patient preferences, affordability, and cultural factors should be prioritized. While the findings align with global research, certain details are specific to India. India's dual burden of infectious and chronic diseases often limits resource allocation for T2D management, unlike high-income countries where diabetes care receives more structured funding. International models often emphasize patient-centric approaches, including technology-based adherence tools (e.g., apps, SMS reminders), which are slowly gaining traction in India. Additionally, community-based interventions, personalized counseling, and peer support programs are being explored to enhance adherence and long-term disease management. Empowering patients through self-management education, culturally tailored lifestyle modifications, and family involvement further strengthens engagement and improves treatment outcomes. However, similarities in adherence barriers and the QoL impact across geographies highlight the shared challenges of managing T2D globally. The single-center experience and cross-sectional design of the study pose limitations, which may hinder its generalizability.

Conclusions

The study provides valuable insights into the relationship between medication adherence, glycemic

control, and QoL in T2D patients. Its findings are consistent with Indian and international literature, emphasizing the universal challenges of adherence and its pivotal role in diabetes management. By addressing adherence barriers and tailoring interventions to specific patient populations, significant improvements in glycemic outcomes and QoL can be achieved. The study's implications extend beyond India, contributing to the global discourse on optimizing T2D care.

Article information

Data availability statement

All data generated and/or analyzed during this study are included in this article.

Ethics statement

The study was approved via Approval No IEC--MGMMC/2022-03/17

Author contributions

S.J.: concept, design, definition of intellectual content, literature search, clinical studies, data acquisition, data analysis, manuscript preparation, and review; A.K.G.: data acquisition, manuscript preparation, and review; S.M.: literature search, clinical studies, data analysis, statistical analysis, manuscript preparation, editing, and review.; N.E.: design and definition of intellectual content, and manuscript review.

Funding

No funding received for this work.

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. Hameed I, Masoodi SR, Mir SA, et al. Type 2 diabetes mellitus: From a metabolic disorder to an inflammatory condition. World J Diabetes. 2015; 6(4): 598–612, doi: 10.4239/wjd.v6.i4.598, indexed in Pubmed: 25987957.
2. Sugandh F, Chandio M, Raveena F, et al. Advances in the Management of Diabetes Mellitus: A Focus on Personalized Medicine. Cureus. 2023; 15(8): e43697, doi: 10.7759/cureus.43697, indexed in Pubmed: 37724233.
3. Williams JS, Walker RJ, Smalls BL, et al. Patient-Centered Care, Glycemic Control, Diabetes Self-Care, and Quality of Life in Adults with Type 2 Diabetes. Diabetes Technol Ther. 2016; 18(10): 644–649, doi: 10.1089/dia.2016.0079, indexed in Pubmed: 27541872.
4. Islam SM, Purnat TD, Phuong NT, et al. Non-communicable diseases (NCDs) in developing countries: a symposium report. Global Health. 2014; 10: 81, doi: 10.1186/s12992-014-0081-9, indexed in Pubmed: 25498459.
5. Saeedi P, Petersohn I, Salpea P, et al. IDF Diabetes Atlas Committee. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9 edition. Diabetes Res Clin Pract. 2019; 157: 107843, doi: 10.1016/j.diabres.2019.107843, indexed in Pubmed: 31518657.
6. Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clin Proc. 2011; 86(4): 304–314, doi: 10.4065/mcp.2010.0575, indexed in Pubmed: 21389250.
7. Kleinsinger F. The Unmet Challenge of Medication Nonadherence. Perm J. 2018; 22: 18–033, doi: 10.7812/TPP/18-033, indexed in Pubmed: 30005722.
8. Kvarnström K, Westerholm A, Airaksinen M, et al. Factors Contributing to Medication Adherence in Patients with a Chronic Condition: A Scoping Review of Qualitative Research. Pharmaceutics. 2021; 13(7), doi: 10.3390/pharmaceutics13071100, indexed in Pubmed: 34371791.
9. Balarajan Y, Selvaraj S, Subramanian SV. Health care and equity in India. Lancet. 2011; 377(9764): 505–515, doi: 10.1016/S0140-6736(10)61894-6, indexed in Pubmed: 21227492.
10. Sherwani SI, Khan HA, Ekhzaimy A, et al. Significance of HbA1c Test in Diagnosis and Prognosis of Diabetic Patients. Biomark Insights. 2016; 11: 95–104, doi: 10.4137/BMI.S38440, indexed in Pubmed: 27398023.
11. Basu S, Garg S, Sharma N, et al. Adherence to self-care practices, glycemic status and influencing factors in diabetes patients in a tertiary care hospital in Delhi. World J Diabetes. 2018; 9(5): 72–79, doi: 10.4239/wjd.v9.i5.72, indexed in Pubmed: 29988911.
12. King P, Peacock I, Donnelly R. The UK prospective diabetes study (UKPDS): clinical and therapeutic implications for type 2 diabetes. Br J Clin Pharmacol. 1999; 48(5): 643–648, doi: 10.1046/j.1365-2125.1999.00092.x, indexed in Pubmed: 10594464.
13. Kassahun A, Gashe F, Mulisa E, et al. Nonadherence and factors affecting adherence of diabetic patients to anti-diabetic medication in Assela General Hospital, Oromia Region, Ethiopia. J Pharm Bioallied Sci. 2016; 8(2): 124–129, doi: 10.4103/0975-7406.171696, indexed in Pubmed: 27134464.
14. World Health Organization (1996) WHO-BREF: Introduction, administration, scoring and generic version of the assessment. 1996. Geneva: WHO. http://www.who.int/mental_health/media/en/76.pdf (14.12.2024).
15. Ramachandran A, Snehalatha C, Kapur A, et al. Diabetes Epidemiology Study Group in India (DESI). High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia. 2001; 44(9): 1094–1101, doi: 10.1007/s001250100627, indexed in Pubmed: 11596662.
16. Rajasekharan D, Kulkarni V, Unnikrishnan B, et al. Self-care activities among patients with diabetes attending a tertiary care hospital in mangalore karnataka, India. Ann Med Health Sci Res. 2015; 5(1): 59–64, doi: 10.4103/2141-9248.149791, indexed in Pubmed: 25745579.
17. Sasi ST, Kodali M, Burra KC, et al. Self Care Activities, Diabetic Distress and other Factors which Affected the Glycaemic Control in a Tertiary Care Teaching Hospital in South India. J Clin Diagn Res. 2013; 7(5): 857–860, doi: 10.7860/JCDR/2013/5726.2958, indexed in Pubmed: 23814728.
18. García-Pérez LE, Alvarez M, Dilla T, et al. Adherence to therapies in patients with type 2 diabetes. Diabetes Ther. 2013; 4(2): 175–194, doi: 10.1007/s13300-013-0034-y, indexed in Pubmed: 23990497.
19. Puvvada RK, Gupta S, Tang CY, et al. Factors affecting self-medication practices among people living with type 2 diabetes in India- A systematic review. Metabol Open. 2021; 9: 100073, doi: 10.1016/j.metop.2020.100073, indexed in Pubmed: 33364596.
20. Sharma MG, Popli H. Challenges for Lower-Middle-Income Countries in Achieving Universal Healthcare: An Indian Perspective. Cureus. 2023; 15(1): e33751, doi: 10.7759/cureus.33751, indexed in Pubmed: 36655151.
21. Mishra R, Sharma SK, Verma R, et al. Medication adherence and quality of life among type-2 diabetes mellitus patients in India. World J Diabetes. 2021; 12(10): 1740–1749, doi: 10.4239/wjd.v12.i10.1740, indexed in Pubmed: 34754375.

22. Weaver RR, Lemonde M, Payman N, et al. Health capabilities and diabetes self-management: the impact of economic, social, and cultural resources. Soc Sci Med. 2014; 102: 58–68, doi: 10.1016/j.socscimed.2013.11.033, indexed in Pubmed: 24565142.
23. Gebremedhin T, Workicho A, Angaw DA. Health-related quality of life and its associated factors among adult patients with type II diabetes attending Mizan Tepi University Teaching Hospital, Southwest Ethiopia. BMJ Open Diabetes Res Care. 2019; 7(1): e000577, doi: 10.1136/bmjdrc-2018-000577, indexed in Pubmed: 30899526.
24. DeFronzo RA. Combination therapy with GLP-1 receptor agonist and SGLT2 inhibitor. Diabetes Obes Metab. 2017; 19(10): 1353–1362, doi: 10.1111/dom.12982, indexed in Pubmed: 28432726.
25. Tolley A, Hassan R, Sanghera R, et al. Interventions to promote medication adherence for chronic diseases in India: a systematic review. Front Public Health. 2023; 11: 1194919, doi: 10.3389/fpubh.2023.1194919, indexed in Pubmed: 37397765.
26. Shah D, Gajjar D, Kapadia D, et al. Prevalence of Patient Awareness and Compliance in T2D Patients in the Urban Ahmedabad Region: A Retrospective and Prospective Study. Clin Diabetol. 2024; 13(4): 200–207, doi: 10.5603/cd.100771.