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## MEDICATION ADHERENCE AND ITS DETERMINANTS AMONG PATIENTS WITH DIABETES MELLITUS: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

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Article Received: 14 February 2026

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Article Revised: 05 March 2026

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Published on: 25 March 2026

DOI: <https://doi-doi.org/101555/ijrpa.6129>

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### ABSTRACT:

Medication adherence is a critical determinant of effective diabetes management and long-term clinical outcomes. This study aimed to assess medication adherence and its associated factors among patients with diabetes mellitus. A community-based cross-sectional study was conducted among 207 diabetic patients in and around Guntur, Andhra Pradesh, between August and December 2025. Sociodemographic characteristics, clinical profiles, lifestyle practices, and treatment patterns were collected using a structured questionnaire. Medication adherence was evaluated using the Morisky Medication Adherence Scale (MMAS-8), and the collected data were analyzed descriptively. The results showed that the majority of participants demonstrated medium medication adherence (86%), while 10.62% exhibited low adherence and only 3.38% showed high adherence. Adherence patterns were generally consistent across most sociodemographic variables such as age, gender, education, income, and residence. Similarly, clinical factors including disease condition, comorbidities, disease onset, and treatment duration showed minimal variation in adherence levels. Lifestyle behaviors such as regular medication intake, physical activity, dietary practices, and frequency of medical check-ups showed slight differences, with somewhat higher adherence observed among patients who practiced regular walking and attended frequent follow-ups. Forgetfulness, perceived side effects, and inconvenience of daily medication were identified

as the main reasons for reduced adherence. Overall, the study indicates that while most diabetic patients maintain moderate adherence, optimal adherence remains limited. Strengthening patient education, improving follow-up care, simplifying treatment regimens, and enhancing patient self-management may improve long-term diabetes outcomes.

**KEYWORDS:** Medication adherence, Diabetes mellitus, Antidiabetic drugs, Lifestyle factors, Morisky scale, Self-care behavior.

## **I. INTRODUCTION:**

### **Global occurrence and increasing burden:**

Diabetes mellitus is a rapidly rising global public health emergency that is putting an enormous and increasing strain on healthcare systems, economies, and societies, especially in low- and middle-income nations that are going through rapid epidemiological transitions <sup>[1]</sup>. In addition to the disease's chronic nature, which necessitates ongoing management and puts a drain on resources, this growing burden also reflects serious disparities in access to care and education. <sup>[2]</sup>

Type 1 diabetes is an autoimmune disease that requires lifelong insulin therapy; Type 2 diabetes is characterized by insulin resistance and progressive beta-cell dysfunction and accounts for the majority of cases worldwide; and gestational diabetes is a condition that develops during pregnancy <sup>[3]</sup>. Particularly, studies show that although the problems of medication adherence and quality of life are common to all types, they present in different ways. For example, research on Type 1 diabetes usually focuses on the difficulties of adhering to an insulin regimen, whereas research on Type 2 diabetes usually focuses on adherence to oral hypoglycemic agents and the effects of polypharmacy. <sup>[4]</sup>

Inadequate diabetes management results in serious and expensive complications that can be broadly divided into macrovascular diseases, which include markedly increased risks of peripheral arterial disease, ischemic heart disease, and stroke, and microvascular pathologies, which include retinopathy, which can cause blindness, nephropathy, which can cause kidney failure, and neuropathy, which increases the risk of foot ulcers and amputations <sup>[5]</sup>. Effective prevention and management strategies are economically necessary because managing these complications accounts for a significant portion of healthcare spending and has a direct impact on health systems through higher hospitalization rates, the need for specialized care, and lost productivity. <sup>[6]</sup>

Effective long-term care, which depends on reaching and sustaining optimum glycemic control by a mix of medication, lifestyle changes, and ongoing patient education, is the cornerstone of reducing the debilitating consequences of diabetes <sup>[7]</sup>. Since the daily burdens of self-management, fear of complications, and medication side effects can significantly impair a patient's psychological and social well-being if not properly addressed, successful long-term management is measured not only by clinical biomarkers like HbA1c but also by patient-centered outcomes, particularly health-related quality of life (HRQoL) <sup>[8]</sup>. Glycemic objectives and quality of life are integrated in this holistic approach to management, which is crucial for enhancing overall patient outcomes and guaranteeing the long-term viability of treatment plans. <sup>[9]</sup>

### **General Introduction on Medication Adherence:**

The World Health Organization (WHO) defines medication adherence as "the degree to which the person's behavior corresponds with the agreed recommendations from a health care provider." This concept, which covers not only pharmaceutical use but also dietary and lifestyle changes that are essential for managing chronic diseases, places more emphasis on a cooperative interaction between the patient and the clinician than on passively following instructions <sup>[10]</sup>. Dosing timing (taking medication at the appropriate intervals), dosing frequency (taking the recommended number of doses per day), and dosing completeness (taking the entire prescribed dose amount) are the three main components that clinical literature uses to precisely operationalize adherence <sup>[11]</sup>. The important distinction between compliance and adherence is highlighted in modern healthcare, where compliance refers to passive patient obedience, a term that is now mostly out of use because of its paternalistic connotations, while adherence is an active, voluntary partnership where patients are supported in their treatment <sup>[12]</sup>. A medication possession ratio (MPR) of  $\geq 80\%$  is clinically defined as optimal medication adherence in diabetes management. This means that patients have enough medication to cover at least 80% of their prescribed treatment days, a threshold that is consistently linked to better glycemic outcomes. <sup>[13]</sup>

The process is broken down into three separate temporal phases by modern adherence conceptualization, which offers a framework for focused treatments. When the patient gives the first dose of a freshly prescribed medication within a specified time frame after the prescription date, it is known as initiation, and it is the crucial first step <sup>[14]</sup>. Implementation is the term used to characterize the continuous execution phase, which accurately assesses how closely the patient's actual dosing history—including timing, dosage, and frequency—

corresponds with the recommended regimen from the time of initiation until the last dose is taken. This phase records daily execution errors as well as non-adherence patterns <sup>[15]</sup>. In lifelong chronic conditions like diabetes, where stopping treatment significantly increases the risk of complications, persistence measures the ultimate duration of therapy, or the continuous length of time from initiation until the patient permanently discontinues the medication <sup>[16]</sup>. The final phase of persistence is discontinuation, which happens when a patient stops taking a medicine without a prescription and does not start again, frequently due to side effects or a perceived lack of benefit. <sup>[17]</sup>

Adherence is a complex habit impacted by a network of interrelated factors in five different domains. Patient-related factors include physical limitations (visual impairment, decreased dexterity affecting insulin administration), psychological barriers (depression, anxiety, diabetes distress, and denial of illness severity), and cognitive aspects (forgetting, poor health literacy, and misinterpreting instructions) <sup>[8]</sup>. Therapy-related factors include the perceived burden of lifestyle changes required with medication (dietary restrictions, glucose monitoring demands), side effect profiles (especially fear of hypoglycemia with insulin and certain oral agents), and treatment complexity (number of medications, frequency of dosing, special administration instructions) <sup>[5]</sup>. Interpersonal (quality of patient-provider communication, cultural competency of providers, continuity of care), structural (short consultation times, limited appointment availability, complicated referral processes), and educational (inadequate medication counseling, inadequate written instructions) are all factors related to the healthcare system <sup>[18]</sup>. Direct drug costs, insurance coverage restrictions, transportation issues to pharmacies and clinics, stigma associated with health issues, and a lack of social support networks for both practical help, emotional support are examples of socioeconomic variables that constitute basic external barriers <sup>[19]</sup>. Chronicity of the disease, symptom severity, and the existence of co-occurring mental disorders are condition-related factors that jointly affect adherence behaviors. <sup>[20]</sup>

There are many different approaches to accurately assessing adherence, using both subjective and objective metrics with varying degrees of feasibility and precision. Although they are prone to recall bias and social desirability effects, self-report questionnaires such as the 8-item Morisky Medication Adherence Scale (MMAS-8) are frequently used due to their shortness, affordability, and capacity to pinpoint particular obstacles (such as forgetfulness versus deliberate skipping) through structured interviews <sup>[21]</sup>. Although they cannot verify actual ingestion and may overlook primary non-adherence (when prescriptions are never

filled), pharmacy refill records offer objective, longitudinal data through calculated metrics like Medication Possession Ratio (MPR) and Proportion of Days Covered (PDC), providing population-level insights into prescription fulfillment patterns [22]. Despite their higher costs and potential for malfunction or patient tampering, electronic monitoring systems (like Medication Event Monitoring Systems, or MEMS) are the gold standard for research because they use microprocessor-equipped pill bottles that record precise opening dates and times. This allows them to provide the most accurate data on dosing patterns, timing irregularities, and drug holidays [7]. Although biochemical measurements (e.g., serum/urine drug levels, HbA1c for diabetes) provide objective biological proof of medication administration, they are influenced by pharmacokinetic factors, frequently only reflect recent exposure rather than long-term patterns, and are unable to differentiate between patterns of adherence. [23]

### **Determinants of Medication Adherence in Diabetes:**

A major group of factors impacting adherence behaviors are those related to the patient. Although some studies also point out that older age can be linked to more routine behavior, advanced age is a complex challenge because senior patients frequently experience cognitive decline and polypharmacy, which can hinder their ability to maintain complex regimens [24]. Motivation and psychological state play a major role, and a patient's ability to regularly practice self-care activities is greatly reduced when they lack internal motivation or are suffering from disorders like depression and diabetes-specific misery [8]. Furthermore, regardless of other considerations, patients who lack sufficient understanding about their ailment and the purpose of their medication are far less likely to follow their prescribed therapy, making health literacy an essential basis. [2]

One of the main factors influencing adherence is the nature of the treatment itself. A major obstacle is pill load, or the quantity of drugs and daily dosages needed; patients with complicated polypharmacy are more likely to skip doses or stop therapy because of the burdensome nature of their regimen [25]. Adherence is also affected by the modality of therapy; compared to oral antihyperglycemic medications, insulin use frequently poses particular difficulties because of injection anxiety, storage problems, and the technical competence needed for delivery [4]. Most directly, patients may purposefully skip or cut back on dosages to avoid these upsetting feelings due to the experience of negative effects, especially the fear and occurrence of hypoglycemia crises. [5]

Adherence is either aided or hindered by the quality and structure of the healthcare system. The doctor-patient relationship is essential; inadequate patient education from healthcare

practitioners, a lack of collaborative decision-making, and poor communication all lead to decreased comprehension and motivation, which in turn causes reduced adherence [18]. Accessibility and continuity of care are equally important; patients are unable to receive regular follow-up and essential therapy changes due to obstacles such long travel times to clinics, scheduling conflicts, and high consultation prices, which results in gaps in care [26]. On the other hand, integrated care models, such those that use pharmacist-led interventions, show that adherence rates can be significantly raised with methodical assistance from the medical staff. [7]

Socio-economic determinants often override clinical recommendations and patient intentions. Economic constraints represent perhaps the most direct barrier, as patients with low income or inadequate insurance coverage may face the impossible choice between purchasing medication and meeting other basic needs, leading to cost-related non-adherence [1]. Social support systems function as a key positive determinant; strong networks of family and friends provide practical assistance (e.g., reminders, transportation to appointments) and emotional encouragement, which buffer against stress and foster consistent adherence behaviors [27]. Broader social factors, including cultural beliefs, societal stigma associated with chronic disease, and health policies that affect drug affordability and availability, also create significant structural influences on an individual's capacity to maintain long-term adherence. [19]

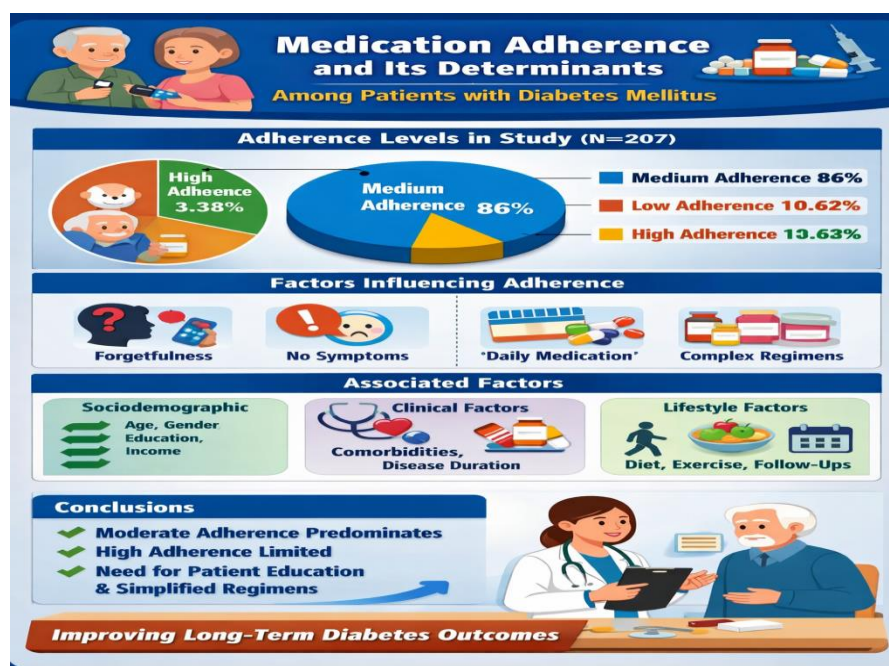


Figure 1: Graphical abstract summarizing medication adherence levels and determinants among diabetic patients in the study population.

## II. MATERIALS AND METHODS

We conducted a community based cross-sectional study among people with diabetes in and surrounding areas of Guntur, among people who are above 18 years, we used Morisky Medication Adherence Scale to assess the level of medication adherence to anti-diabetic drugs. The period was between August 2025 to December 2025. We collected demographic data, medical history, use of medications, and lifestyle factors from the participants by the trained research technicians using a structured questionnaire. we collected data from around 207 patients. We collected data from Both genders included, Age above 18 years were included, Participants who are willing to provide the information. We excluded people who are suffering from Gestational diabetes cases were excluded and also patients with mental health issues, cancer and any other terminal illness, and unwilling to participate.

The present research was conducted through a systematic and sequential process to ensure scientific rigor and validity of outcomes. Initially, the research area was identified based on its clinical relevance and research significance. This was followed by an extensive review of the existing literature using published research articles, review papers, and standard guidelines to understand the current evidence, identify research gaps, and refine the study objectives. Based on the literature review, a structured data collection form was designed to capture all relevant demographic, clinical, and study-specific variables. The data collection tool was prepared in accordance with the study objectives and included validated assessment scales to measure medication adherence and quality of life. Prior to data collection, informed consent was obtained from all participants after explaining the purpose of the study, procedures involved, and assurance of confidentiality. Data were then collected directly from the study participants using the predesigned data collection form. Ethical principles were strictly followed throughout the study period. The collected data were systematically entered into Microsoft Excel for data management and analysis. Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS). Scores were calculated according to the respective scoring guidelines provided for tool. Following data analysis, the results were organized and interpreted in alignment with the study objectives. The findings were then discussed in comparison with previously published studies to highlight similarities, differences, and the clinical implications of the results. The outcomes of the study were used to draw meaningful conclusions and recommendations for future research and clinical practice.

### III. RESULTS AND DISCUSSION

**TABLE-1: ASSOCIATION BETWEEN DEMOGRAPHIC DETAILS AND MEDICATION ADHERENCE.**

<b>AGE INTERVAL</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
21-30(1)	0 (0%)	1 (100%)	0 (0%)
31-40 (27)	3 (11.11%)	23 (85.19%)	1 (3.70%)
41-50 (67)	4 (5.97%)	60 (89.55%)	3 (4.48%)
51-60 (62)	9 (14.52%)	50 (80.65%)	3 (4.84%)
61-70 (32)	5 (15.63%)	27 (84.38%)	0 (0%)
71-80 (14)	0 (0%)	14 (100%)	0 (0%)
81-90 (4)	1 (25%)	3 (75%)	0 (0%)
<b>SMOKING STATUS</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Non- smoker (125)	13 (10.4%)	108 (86.4%)	4 (3.2%)
Ex-smoker (34)	3 (8.82%)	29 (85.29%)	2 (5.88%)
Occasional (9)	1 (11.11%)	8 (88.89%)	0 (0%)
Smoker (39)	5 (12.82%)	33 (84.62%)	1 (2.56%)
<b>ALCOHOLIC STATUS</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Non- Alcoholic (125)	15 (12%)	106 (84.8%)	4 (3.2%)
Ex- Alcoholic (29)	2 (6.90%)	24 (82.76%)	3 (10.34%)
Occasional (15)	1 (6.67%)	14 (93.33%)	0 (0%)
Alcoholic (38)	4 (10.53%)	34 (89.47%)	0 (0%)
<b>RESIDENCE</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
RURAL (88)	7 (7.95%)	78 (88.64%)	3 (3.41%)
URBAN (119)	15 (12.61%)	100 (84.03%)	4 (3.36%)
<b>OCCUPATION</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Business (34)	3 (8.82%)	31 (91.18%)	0 (0%)
Dependent (49)	4 (8.16%)	43 (87.76%)	2 (4.08%)
Employed (57)	6 (10.53%)	50 (87.72%)	1 (1.75%)
Self-employed (67)	9 (13.43%)	54 (80.60%)	4 (5.97%)
<b>EDUCATION</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
No-Education (24)	1 (4.17%)	20 (83.33%)	3 (12.5%)
Primary (71)	10 (14.08%)	60 (84.51%)	1 (1.41%)
Secondary (57)	5 (8.77%)	51 (89.47%)	1 (1.75%)
Under graduate (37)	2 (5.41%)	33 (89.19%)	2 (5.41%)
Post graduate (18)	4 (22.22%)	14 (77.78%)	0 (0%)
<b>MARRITAL STATUS</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Divorced (1)	0 (0%)	1 (100%)	0 (0%)
Single (4)	1 (25%)	3 (75%)	0 (0%)
Married (194)	21 (10.82%)	166 (85.57%)	7 (3.61%)
Widower (8)	0 (0%)	8 (100%)	0 (0%)

<b>ANNUAL INCOME</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
<10,000 (34)	5 (14.71%)	27 (79.41%)	2 (5.88%)
<20,000 (46)	7 (15.22%)	39 (84.78%)	0 (0%)
<30,000 (48)	3 (6.25%)	42 (87.50%)	3 (6.25%)
>30,000 (42)	5 (11.90%)	37 (88.10%)	0 (0%)
No-income (37)	2 (5.41%)	33 (89.19%)	2(5.41%)
<b>GENDER</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Male (4)	0 (0%)	4 (100%)	0 (0%)
Female (33)	2 (6.06%)	29 (87.88%)	2 (6.06%)

Table 1 shows only a tiny percentage of participants in the current study showed high medication adherence, with medium adherence predominating across the majority of sociodemographic and lifestyle characteristics. With very slight differences between subgroups, adherence patterns were generally similar across age groups, smoking and drinking status, domicile, occupation, education, marital status, income, and gender. While postgraduate and some low-income participants demonstrated relatively lower adherence, ex-smokers, ex-alcoholics, and certain moderate-income groups exhibited slightly greater high-adherence proportions. All things considered, the current study shows rather constant adherence levels across factors with negligible group variations.

According to Khayyat et al.'s study, quality of life was substantially correlated with medication adherence across the majority of sociodemographic factors. Participants who were adherent, male, educated, and had higher incomes reported better QoL scores; those who were dissatisfied with their income and females reported lower scores. There were few differences in smoking status between the groups. Overall, the research population's QoL was found to be significantly predicted by adherence, gender, income, and education. <sup>[28]</sup>

Medication adherence and variables such gender, wealth, and education shown distinct variations in quality-of-life outcomes in the Khayyat et al. study. On the other hand, the current study identified very slight differences between groups in adherence levels across the majority of sociodemographic and lifestyle characteristics. This offers a more comprehensive real-world perspective on medication adherence among diabetic patients and implies that adherence behaviour in the current population is more consistent across subgroups.

**TABLE-2: INFLUENCE OF MEDICAL PROFILE ON MEDICATION ADHERENCE SCORES**

<b>DISEASE CONDITION</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Diabetes only (106)	11 (10.38%)	92 (86.79%)	3 (2.83%)
Diabetes and HTN (68)	6 (8.82%)	61 (89.71%)	1 (1.47%)
Diabetes, co-morbidities& no HTN (13)	3 (23.08%)	9 (69.23%)	1 (7.69%)
Diabetes, co-morbidities &HTN (20)	2 (10.00%)	16 (80.00%)	2 (10.00%)
<b>NO OF CO-MORBIDITES</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
0(106)	11 (10.38%)	92 (86.79%)	3 (2.83%)
1(80)	9 (11.25%)	69 (86.25%)	2 (2.50%)
2(21)	2 (9.52%)	17 (80.95%)	2 (9.52%)
<b>ONSET OF DISEASE</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
20-30(1)	1 (100%)	0 (0%)	0 (0%)
30-40(44)	4 (9.09%)	38 (86.36%)	2 (4.55%)
40-50(84)	13 (15.48%)	67 (79.76%)	4 (4.76%)
50-60(51)	1 (1.96%)	3 (5.88%)	47 (92.16%)
60-70(21)	2 (9.52%)	19 (90.48%)	0 (0%)
70-80(0)	0	6(100.00%)	0
<b>DURATION OF TREATMENT</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
< 1 year (7)	0 (0%)	7 (100%)	0 (0%)
1-2 years (37)	4 (10.81%)	31 (83.78%)	2 (5.41%)
3-5 year (40)	2 (5.00%)	36 (90.00%)	2 (5.00%)
>5 years (123)	16 (13.01%)	104 (84.55%)	3 (2.44%)

Table 2 shows all clinical factors, including disease status, number of co-morbidities, disease onset, and length of treatment, were dominated by medium medication adherence in the current study. There were very slight differences in the adherence habits of patients with diabetes alone and those with hypertension or other co-morbidities. Low adherence was comparatively more common among patients with earlier disease onset, whereas slightly greater proportions of patients with numerous co-morbidities and those with later disease onset (50–60 years) had high adherence. All categories exhibited consistent levels of adherence during the course of treatment. Overall, there were no discernible differences between groups and adherence seemed to be rather stable across clinical features.

In the Manan et al. study, the majority of clinical and sociodemographic factors, such as gender, education, income, marital status, BMI, and number of medications, did not significantly correlate with medication adherence among older diabetic patients. The only

factors that were correlated with improved adherence were HbA1c levels and longer disease duration; adherence levels were typically comparable across disease categories and comorbidity status. Overall, the study indicates that the primary determinants of adherence were clinical control measures rather than demographic or illness qualities. [29]

The current study, like the one by Manan et al., demonstrated no significant correlation between medication adherence and the majority of clinical characteristics. Our results demonstrated comparatively steady adherence across disease conditions, comorbidities, and treatment duration, whereas the reference trial found significant associations only with HbA1c levels and longer disease duration. This reinforces the generalizability of our findings by demonstrating that adherence in the current sample seems to be stable across various clinical characteristics.

**TABLE-3: INFLUENCE OF LIFE STYLE MODIFICATIONS ON MEDICATION ADHERENCE SCORES.**

<b>ON REGULAR MEDICATION</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
YES (192)	20 (10.42%)	166 (86.46%)	6 (3.13%)
NO (15)	2 (13.33%)	12 (80.00%)	1 (6.67%)
<b>PHYSICAL ACTIVITY</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Aerobic exercise (10)	1 (10.00%)	9 (90.00%)	0 (0%)
Walking (139)	11 (7.91%)	121 (87.05%)	7 (5.04%)
Others (58)	10 (17.24%)	48 (82.76%)	0 (0%)
<b>ON DIET MAINTENANCE</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Yes (157)	18 (11.46%)	133 (84.71%)	6 (3.82%)
No (60)	4 (6.67%)	45 (75.00%)	1 (1.67%)
<b>CHECK-UP FREQUENCY</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
3 Monthly (48)	2 (4.17%)	43 (89.58%)	3 (6.25%)
6 Months (25)	6 (24.00%)	18 (72.00%)	1 (4.00%)
Bimonthly (42)	5 (11.90%)	36 (85.71%)	1 (2.38%)
Monthly (84)	8 (9.52%)	74 (88.10%)	2 (2.38%)
Occasionally (4)	0 (0%)	4 (100%)	0 (0%)
Yearly (4)	1 (25.00%)	3 (75.00%)	0(0%)

Table 3 shows all lifestyle and follow-up characteristics in the current investigation, such as frequent medication use, physical activity, diet maintenance, and check-up frequency, were associated with medium medication adherence. Only a tiny percentage of participants shown high adherence, with the majority of those on regular medication and those following a diet exhibiting medium adherence. Compared to aerobic exercise and other physical activities,

walking was linked to somewhat greater high-adherence proportions. Participants who attended 3-monthly check-ups had comparatively greater high-adherence rates than those who attended less frequently, but those who attended 6-monthly and annual follow-ups had comparatively higher proportions of low-adherence. With relatively slight differences between categories, adherence levels generally stayed fairly constant across behavioural variables.

According to Jannoo et al.'s study, quality of life was significantly but moderately correlated with medication adherence and self-care practices like food control, exercise, and clinic follow-ups. Treatment adherence and perceived health outcomes in diabetic patients are influenced by self-care behaviours, as evidenced by the rather constant adherence patterns across lifestyle variables. <sup>[30]</sup>

The current study also showed mostly medium adherence across variables like regular medication intake, physical activity, dietary practices, and follow-up frequency, which is consistent with the findings of Jannoo et al., who reported moderate associations between lifestyle behaviours and medication adherence among patients with type 2 diabetes. Nonetheless, our study's adherence rates seemed to be rather consistent across lifestyle categories, with little variance between groups. This supports the wider relevance of our findings in actual clinical settings and shows a consistent adherence trend within the research population.

**TABLE 4: INFLUENCE OF MEDICAL SUPPORT ON MEDICATION ADHERENCE SCORES.**

<b>SOURCE OF MEDICATION</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Hospital pharmacy (121)	14 (11.57%)	104 (85.95%)	3 (2.48%)
Private clinic (36)	5 (13.89%)	30 (83.33%)	1 (2.78%)
Private Pharmacy (43)	3 (6.98%)	37 (86.05%)	3 (6.98%)
Via Family Members (7)	0 (0%)	7 (100%)	0 (0%)
<b>SOURCE OF CARE</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
Care taken by family members (53)	4 (7.55%)	49 (92.45%)	0 (0%)
Self-Care (154)	18 (11.69%)	129 (83.77%)	7 (4.55%)

Table 4 shows across all drug sources, 83–100% of patients had medium adherence. Users of private pharmacies had the highest adherence rate (6.98%), whereas those who got their medications from family members did not. When it came to care, self-care demonstrated

some high adherence (4.55%), whereas family-dependent care did not exhibit any high adherence. In general, improved adherence results seem to be supported by patient self-management and organised pharmacy access.

Krass et al. shown that behavioural and access-related factors, such as patient self-management and pharmacy access, are the main drivers of medication adherence in diabetes. The main causes of low adherence were dependence on others, fear of negative consequences, perceived lack of benefit, and forgetfulness. Beyond prescriptions alone, the study highlights that patient autonomy and direct pharmacy access are essential for long-term adherence. [31]

The current results are in good agreement with Krass et al., demonstrating that access and autonomy, not only prescription, have a significant influence on drug adherence. Our study supports their findings by demonstrating that self-care and formal medicine sources are linked to increased adherence, whereas family-mediated access is insufficient to attain high adherence. All of these findings point to the importance of patient self-management and direct pharmacy access in promoting long-term adherence, while reliance on others may increase unpredictability and decrease consistency in adherence.

**TABLE 5: ASSOCIATION BETWEEN CLASS OF DRUGS AND MEDICATION ADHERENCE.**

<b>CLASS OF DRUGS</b>	<b>LOW ADHERENCE</b>	<b>MEDIUM ADHERENCE</b>	<b>HIGH ADHERENCE</b>
BIGUANIDES (130)	15 (11.54%)	111 (85.38%)	4 (3.08%)
SULFONYLUREAS (110)	13 (11.82%)	91 (82.73%)	6 (5.45%)
MEGLITANIDES (5)	1 (20.00%)	4 (80.00%)	0 (0%)
DPP-4 INHIBITORS (32)	2 (6.25%)	29 (90.63%)	1 (3.13%)
SGLT-2 INHIBITORS (4)	0 (0%)	4 (100%)	0 (0%)
ALPHA GLUCOSIDASE INHIBITORS (11)	1 (9.09%)	10 (90.91%)	0 (0%)
THIAZOLIDINEDIONES (8)	1 (12.50%)	7 (87.50%)	0 (0%)
INSULIN PREPARATIONS (10)	2 (20.00%)	8 (80.00%)	0 (0%)

Table 5 shows across all antidiabetic medication classes, medium adherence predominated (80–100%), suggesting that the majority of patients adhere to treatment at a moderate level. Only biguanides, sulfonylureas, and DPP-4 inhibitors exhibited high adherence, which was extremely low; other groups shown no high adherence at all. Insulin and meglitinides had relatively greater low adherence rates (20%), most likely as a result of the complexity of the

regimen. Overall, there are still few pharmacological categories with optimal (high) adherence.

Polonsky et al. showed that regimen complexity, not pharmacological efficacy, had a significant impact on medication adherence in type 2 diabetes. In contrast to injectable treatments, multiple daily dosage, and complex regimens, the study found that simpler oral regimens, especially once-day medicines, had higher adherence. Treatment burden, discomfort, and lifestyle disturbance were the main causes of decreased adherence, indicating that therapy simplicity is a crucial factor in long-term adherence.<sup>[32]</sup>

The current results are consistent with those of Polonsky et al. (2011), who showed that medication adherence in type 2 diabetes is highly influenced by regimen complexity. Across all drug classes, medium adherence was more common than high adherence, especially with insulin and meglitinides, where low adherence was more prevalent (20%). These findings corroborate the hypothesis that complicated dosage regimens and injectable treatments lower long-term adherence. All things considered, streamlining treatment plans is crucial to achieving the best possible adherence rates.

**TABLE 6: ASSOCIATED REASONS FOR MEDICATION ADHERENCE DEVIATION.**

REASON FOR ADHERENCE	LOW ADHERENCE	MEDIUM ADHERENCE	HIGH ADHERENCE
Forgetfulness (159)	18 (11.32%)	141 (88.68%)	0 (0%)
No specific reason (7)	0 (0%)	0 (0%)	7 (100%)
Feeling worse on taking medicine (22)	13 (59.09%)	9 (40.91%)	0 (0%)
I feel like no symptoms (11)	1 (9.09%)	10 (90.91%)	0 (0%)
Everyday medication is inconvenience (23)	4 (17.39%)	19 (82.61%)	0 (0%)

Table 6 shows High adherence was quite low (3.38%), while the majority of patients had medium adherence (85.99%). The most frequent explanation was forgetfulness, which was primarily linked to moderate adherence. The influence of reported side effects was demonstrated by the substantial correlation (59.09%) between low adherence and feeling worse after taking medicine. Suboptimal adherence was also linked to inconvenience and symptom absence, indicating behavioural and perception-related obstacles.

According to Krass et al., many individuals with diabetes have inadequate medication adherence, which varies greatly. According to the review, the main causes of poor adherence

include behavioural and access-related variables such cost, sadness, perceived lack of benefit, fear of negative consequences, and forgetfulness. Overall, the results highlight that sustained adherence is not just determined by medication efficacy but also by modifiable patient views and structural impediments. [31]

The current results are consistent with Krass et al., showing that behavioural factors influence medication adherence in diabetes, which is still generally unsatisfactory. Partial compliance was indicated by extremely low high adherence and medium adherence in the majority of patients. The main obstacle was forgetfulness, and low adherence was largely caused by perceived negative effects. Both findings show that sustained adherence is not solely determined by medication efficacy but also by modifiable attitudes and practical obstacles.

**TABLE- 7: MEDICATION ADHERENCE STATUS.**

Adherence status	FREQUENCY	PERCENTAGE	P value
High	7	3.38%	X <sup>2</sup> =259.91 p-value=3.64 × 10 <sup>-57</sup>
Medium	178	86%	
Low	22	10.62%	

The table 7 shows the distribution of medication adherence among the study participants. Out of the total patients, the majority demonstrated medium adherence (178; 86%), while 22 patients (10.62%) showed low adherence, and only 7 patients (3.38%) exhibited high adherence. The statistical analysis showed a Chi-square value of 259.91 with a p-value of  $3.64 \times 10^{-57}$ , indicating that the difference in adherence levels among the participants was highly statistically significant. Overall, the findings suggest that most patients had moderate levels of medication adherence, with only a small proportion achieving high adherence.

A study conducted by Kolla S. C. et al. reported that 46% of patients demonstrated medium medication adherence, followed by 28% with high adherence and 26% with low adherence among Type 2 diabetes mellitus patients assessed using the MMAS-8 scale. These findings indicate that moderate adherence was the most commonly observed level among diabetic patients [33].

The present study found that the majority of diabetes mellitus patients demonstrated medium medication adherence (86%), followed by low adherence (10.62%) and high adherence (3.38%). Similar findings were reported in a study conducted by Kolla SC et al., where medium adherence was the most commonly observed among type 2 diabetes mellitus patients. This indicates that moderate adherence is prevalent among diabetic patients, while achieving high adherence remains relatively low.

#### **IV CONCLUSION:**

The present study evaluated medication adherence among patients with diabetes mellitus and examined its association with various sociodemographic, clinical, lifestyle, and treatment-related factors. The findings revealed that the majority of participants demonstrated medium medication adherence (86%), while 10.62% exhibited low adherence and only 3.38% showed high adherence, indicating that most patients partially adhere to their prescribed treatment regimens, whereas optimal adherence remains relatively limited. Statistical analysis further confirmed that the distribution of adherence levels among participants was highly significant. Across sociodemographic characteristics such as age, education, occupation, income, marital status, and place of residence, medication adherence patterns remained largely consistent, with medium adherence predominating in most groups. Similarly, clinical factors including disease condition, presence of comorbidities, disease onset, and duration of treatment showed minimal variation in adherence behavior. Lifestyle practices such as regular medication intake, physical activity, dietary maintenance, and frequency of medical check-ups were also associated predominantly with medium adherence levels, suggesting that adherence behavior in the study population is relatively stable across behavioral and health-related characteristics. The study also identified key factors influencing medication adherence. Forgetfulness emerged as the most frequently reported reason for deviation from medication adherence, followed by perceived absence of symptoms, inconvenience associated with daily medication intake, and negative experiences after taking medication. These findings highlight the importance of behavioral and perceptual factors in shaping adherence patterns among diabetic patients.

Furthermore, medication adherence varied slightly across different classes of antidiabetic drugs, with medium adherence observed across most pharmacological categories. Lower adherence rates were relatively more common among patients receiving more complex treatment regimens, suggesting that treatment complexity may influence long-term adherence.

Overall, the results of this study indicate that medication adherence among diabetic patients is predominantly moderate, with only a small proportion achieving optimal adherence. These findings emphasize the need for targeted patient education, counseling, adherence-support interventions, and simplification of therapeutic regimens to improve adherence behavior. Strengthening patient awareness, encouraging self-management, and promoting regular

follow-up may contribute to better adherence and ultimately improve therapeutic outcomes and quality of life among patients with diabetes mellitus.

#### **V. ACKNOWLEDMENT:**

The authors would like to express their sincere gratitude to the management and faculty of the Department of Pharmacy Practice for their continuous support and encouragement during the course of this research work. We also thank all the study participants for their valuable cooperation and time, which made this study possible.

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