

ISSN Print: 1813-176x
ISSN Online: 1994-4624

International Journal of Molecular Medicine and Advance Sciences
https://ijmmas.com/

Research Article

Assessment of medication adherence and associated factors among women with gestational diabetes mellitus in a tertiary care hospital.

[1]Swati Ashok Bamane, [2]Dr. Kavya R.
[1]Hinduhriday Samrat Balasaheb Thackeray Medical College, Jogeshwari, Mumbai
[2]K B Bhaba, Bandra West, Mumbai

Correspondence:
Kavya R.

Email: kavyarholla@gmail.com

Received: 08-05-2026
Revised: 22-05-2026
Accepted: 10-06-2026
Published: 25-06-2026

DOI: 10.61336/ijmmas.22-03-16

Abstract: Background: Gestational diabetes mellitus (GDM) is a common metabolic complication of pregnancy associated with adverse maternal and neonatal outcomes. Adherence to prescribed antidiabetic medications is an important component of achieving optimal glycaemic control. Objective: To assess medication adherence and identify associated demographic, clinical, socioeconomic and treatment-related factors among women with gestational diabetes mellitus. ***Materials and Methods***: A hospital-based analytical cross-sectional study was designed involving 150 pregnant women diagnosed with GDM and receiving pharmacological treatment over six months. Data would be collected using a structured questionnaire, medication records, blood glucose reports and treatment adherence assessments. Results: Among 150 participants, 96 (64%) demonstrated adequate medication adherence, while 54 (36%) were classified as non-adherent. Insulin monotherapy was prescribed in 48% of patients, metformin monotherapy in 36%, and combination therapy in 16%. Common barriers to adherence included forgetfulness (42.6%), fear of hypoglycaemia (35.2%), fear of fetal harm (29.6%) and treatment-related adverse effects (27.8%). Adequate glycaemic control was observed in 81.3% of adherent participants compared with 44.4% of non-adherent participants. ***Conclusion***: Medication adherence represents an important component of effective GDM management. Individualized counselling, family support, simplified treatment schedules where clinically appropriate and improved access to diabetes care may help improve adherence and glycaemic outcomes.

Keywords: Gestational diabetes mellitus, medication adherence, insulin, metformin, glycaemic control, pregnancy, pharmacotherapy.

Copyright @ 2026: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Gestational diabetes mellitus is a metabolic disorder characterized by hyperglycaemia diagnosed during pregnancy that does not meet the criteria for overt pre-existing diabetes. It represents a significant public health concern because of its increasing prevalence and potential consequences for maternal and neonatal health.

Pregnancy is associated with progressive physiological insulin resistance, particularly during the second and third trimesters. Placental hormones and other metabolic changes contribute to reduced maternal insulin sensitivity. In women with insufficient pancreatic beta-cell compensation, these physiological adaptations may result in hyperglycaemia and the development of GDM.

Risk factors for GDM include increased maternal age, obesity, family history of diabetes mellitus, previous gestational diabetes, history of delivering a macrosomic infant and underlying metabolic abnormalities. Early identification of high-risk women and appropriate screening are important components of antenatal care.

Poorly controlled GDM may contribute to hypertensive disorders of pregnancy, polyhydramnios, increased operative delivery, fetal macrosomia, shoulder dystocia and neonatal hypoglycaemia. Women with a history of GDM also have an increased long-term risk of developing type 2 diabetes mellitus [1].

Management of GDM involves medical nutrition therapy, appropriate physical activity, blood glucose monitoring and pharmacological treatment when necessary. Lifestyle modification represents an important initial intervention, although some women require medication to achieve recommended glycaemic targets.

Insulin is the preferred pharmacological treatment according to the American Diabetes Association because it allows individualized dose adjustment and does not cross the placenta in clinically meaningful amounts [1]. Metformin is used in selected clinical circumstances under other treatment guidelines, including those developed by the National Institute for Health and Care Excellence [2].

The Metformin in Gestational Diabetes trial conducted by Rowan and colleagues evaluated metformin compared with insulin and contributed to the evidence concerning alternative pharmacological treatment strategies [3]. However, treatment selection should consider maternal characteristics, clinical indications, available evidence and potential fetal implications.
Medication adherence refers to the extent to which a patient's medication-taking behaviour corresponds with an agreed treatment plan. In GDM, adherence is particularly important because the period available to achieve effective glycaemic control before delivery may be limited.

Women receiving insulin may encounter difficulties related to injection technique, treatment schedules, fear of needles, hypoglycaemia and storage requirements. Women prescribed oral medications may experience gastrointestinal adverse effects, concerns regarding fetal safety or uncertainty about the importance of treatment.

Medication adherence may also be influenced by educational status, socioeconomic conditions, healthcare accessibility, family support and communication with healthcare professionals. Qualitative research has demonstrated that women with GDM experience multiple personal, social and healthcare-system barriers to effective disease management [4].

A review of adherence to antidiabetic medications among women with GDM identified considerable variation in adherence estimates and highlighted the influence of medication-related concerns, psychological factors and socioeconomic circumstances [5].

Assessment of medication adherence can help identify patients requiring additional support and guide the development of targeted educational interventions. Understanding the barriers experienced by pregnant women is essential for designing patient-centred diabetes management strategies.

The present study is designed to evaluate medication adherence among women diagnosed with GDM, identify factors associated with non-adherence and examine the relationship between adherence and glycaemic control in a tertiary care hospital.

Aim: To assess medication adherence and associated factors among women with gestational diabetes mellitus.

MATERIALS AND METHODS

Study design
Hospital-based analytical cross-sectional study.

Study setting
Department of Obstetrics and Gynaecology in collaboration with the Departments of Pharmacology and General Medicine or Endocrinology of a tertiary care teaching hospital.

Study duration
Six months following Institutional Ethics Committee approval.

Sample size
A proposed sample of 150 pregnant women diagnosed with GDM and receiving pharmacological treatment.
Assuming an expected medication adherence prevalence of 50%, a confidence level of 95% and an absolute precision of 8%, the calculated sample size would be approximately 150 participants. Additional recruitment would be considered to compensate for incomplete responses.

Inclusion criteria
- Pregnant women aged 18 years and above.
- Women diagnosed with gestational diabetes mellitus according to the institutional diagnostic protocol.
- Patients receiving insulin, metformin or combination pharmacotherapy for at least four weeks.
- Women willing to participate and provide written informed consent.

Exclusion criteria
- Women with known pre-existing type 1 or type 2 diabetes mellitus.
- Women managed exclusively through dietary and lifestyle interventions.
- Patients receiving antidiabetic medications for less than four weeks.
- Patients with incomplete treatment records preventing adherence evaluation.

- Women unwilling to participate.

Study procedure

Eligible participants would be recruited consecutively from the antenatal outpatient department, high-risk pregnancy clinic and diabetes clinic.

A structured data collection questionnaire would be developed and reviewed by experts in obstetrics, pharmacology and endocrinology. Pilot testing would be conducted before commencement of the main study.

Demographic information would include maternal age, educational status, occupation, residence, family structure and socioeconomic characteristics.

Clinical variables would include gravidity, parity, gestational age, family history of diabetes, previous history of GDM, pre-pregnancy body mass index where documented and associated medical conditions.

Treatment-related information would include prescribed antidiabetic medication, dosage, frequency, treatment duration, route of administration and concurrent medications.

Information regarding dietary recommendations, physical activity, self-monitoring of blood glucose and previous diabetes education would also be recorded.

Assessment of medication adherence

Medication adherence would be assessed using a structured dose-recall questionnaire covering the preceding 30 days.

Adherence category	Percentage of prescribed doses taken
High adherence	≥90%
Moderate adherence	80–89%
Low adherence	Below 80%

For statistical analysis, patients with high or moderate adherence would be classified as adherent. Those with low adherence would be classified as non-adherent.

Insulin dose adjustments instructed by treating physicians would be incorporated into the calculation and would not be classified as non-adherence.

Where available, patient medication diaries, prescription records and pharmacy refill information would be used to corroborate self-reported adherence.

Assessment of glycaemic control

Fasting and postprandial blood glucose values would be obtained from clinical records and self-monitoring diaries.

The following commonly used pregnancy-specific glycaemic targets would be considered, subject to the institutional treatment protocol [1]:

Parameter	Glycaemic target
Fasting blood glucose	Below 95 mg/dL
One-hour postprandial glucose	Below 140 mg/dL
Two-hour postprandial glucose	Below 120 mg/dL

Adequate glycaemic control would be operationally defined as at least 80% of available scheduled glucose readings during the preceding two weeks meeting the applicable targets, with a minimum number of readings prespecified before analysis.

Assessment of barriers to adherence

Participants would be questioned regarding forgetfulness, fear of hypoglycaemia, injection discomfort, medication-related adverse effects, treatment expenditure, fetal safety concerns, family support and healthcare accessibility.

Statistical analysis

Data would be analysed using SPSS or equivalent statistical software. Descriptive statistics would summarize clinical characteristics, medication adherence and glycaemic control. Associations between categorical variables would be evaluated using the chi-square test or Fisher's exact test. Multivariable logistic regression would be considered to identify independent predictors of non-adherence, with the number of covariates restricted according to available outcome events. Odds ratios, confidence intervals and p-values would be reported. Statistical significance would be defined as p-value below 0.05.

RESULTS

Table 1. Age distribution of study participants

Age group	Frequency	Percentage
18–20 years	9	6%
21–25 years	45	30%
26–30 years	57	38%

31–35 years	30	20%
Above 35 years	9	6%
Total	**150**	**100%**

The largest proportion of participants belonged to the 26–30-year age group, followed by women aged 21–25 years.

Table 2. Sociodemographic characteristics

Characteristic	Frequency	Percentage
Educational status		
No formal education	12	8%
Primary education	24	16%
Secondary education	63	42%
Graduate and above	51	34%
Residence		
Rural	78	52%
Urban	72	48%
Occupation		
Homemaker	102	68%
Employed	48	32%

Table 3. Obstetric and clinical characteristics

Clinical characteristic	Frequency	Percentage
Primigravida	81	54%
Multigravida	69	46%
Second trimester	54	36%
Third trimester	96	64%
Family history of diabetes	63	42%
Previous history of GDM	21	14%
Pre-pregnancy overweight or obesity	75	50%
Associated hypertension	24	16%
Received structured diabetes counselling	105	70%

Multiple clinical characteristics could occur in individual participants.

Table 4. Distribution according to antidiabetic treatment

Treatment regimen	Frequency	Percentage
Insulin monotherapy	72	48%
Metformin monotherapy	54	36%
Insulin and metformin combination	24	16%
Total	**150**	**100%**



Combination therapy
Insulin monotherapy

- Metformin monotherapy

Table 5. Level of medication adherence

Adherence level	Frequency	Percentage
High adherence	66	44%
Moderate adherence	30	20%
Low adherence	54	36%
Total	**150**	**100%**

Non-adherent patients (n=54)
medication adherence distribution among 150 participants.

Table 6. Medication adherence according to treatment regimen

Treatment regimen	Total	Adherent	Non-adherent	Adherence rate
Insulin	72	42	30	58.3%
Metformin	54	40	14	74.1%
Combination therapy	24	14	10	58.3%
Total	**150**	**96**	**54**	**64.0%**

Metformin-treated patients demonstrated higher adherence in the dataset. This comparison does not establish superiority because treatment selection and baseline disease severity may differ between groups.

Table 7. Reasons for medication non-adherence (n=54)

Reason	Frequency	Percentage
Forgetfulness	23	42.6%
Fear of hypoglycaemia	19	35.2%
Fear of fetal harm	16	29.6%
Medication-related adverse effects	15	27.8%
Fear of injections	14	25.9%
Inadequate knowledge	13	24.1%
Financial difficulties	12	22.2%
Complex medication schedules	11	20.4%
Inadequate family support	9	16.7%
Limited availability of medications	7	13.0%

Multiple responses were permitted.

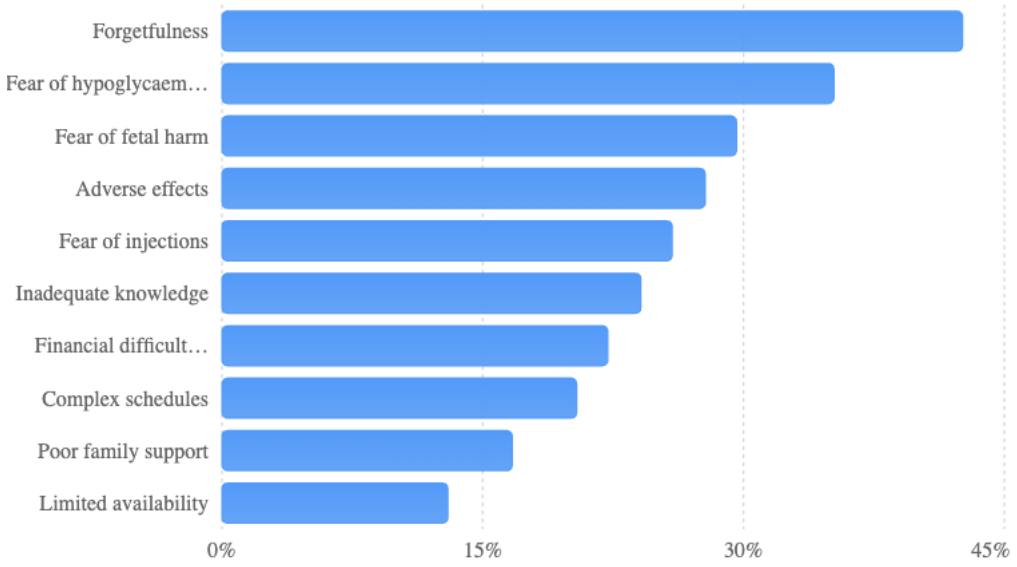

Table 8. Adverse effects reported during antidiabetic treatment

Adverse effect	Frequency	Percentage
Nausea	27	18%
Gastrointestinal discomfort	24	16%
Injection-site discomfort	21	14%

Reported hypoglycaemic episodes	18	12%
Diarrhoea	15	10%
Dizziness	12	8%

These are suspected adverse effects; clinical causality assessment would be required.

Table 9. Association between patient-related factors and adherence

Associated factor	Total patients	Adherent	Adherence rate
Secondary education or above	114	81	71.1%
Primary education or below	36	15	41.7%
Received diabetes counselling	105	78	74.3%
No structured counselling	45	18	40.0%
Adequate family support	108	79	73.1%
Inadequate family support	42	17	40.5%
Regular follow-up	111	81	73.0%
Irregular follow-up	39	15	38.5%
Urban residence	72	50	69.4%
Rural residence	78	46	59.0%

Interpretation: Educational attainment, diabetes counselling, family support and regular follow-up were associated descriptively with better adherence in the population.

Table 10. Relationship between medication adherence and glycaemic control

Adherence status	Adequate control	Inadequate control	Total
Adherent	78 (81.3%)	18 (18.8%)	96
Non-adherent	24 (44.4%)	30 (55.6%)	54
Total	**102 (68%)**	**48 (32%)**	**150**

Adequate glycaemic control was more frequently observed among adherent participants. However, the influence of diet, physical activity, baseline hyperglycaemia and treatment intensity must be considered.

Table 11. blood glucose profiles according to adherence status

Parameter	Adherent (n=96)	Non-adherent (n=54)
Mean fasting glucose (mg/dL)	92.4 ± 10.6	108.6 ± 15.8
Mean two-hour postprandial glucose (mg/dL)	115.8 ± 16.4	142.6 ± 22.8
Mean HbA1c (%)	5.8 ± 0.5	6.5 ± 0.7

Values represent mean ± standard deviation. HbA1c is included as a supplementary measure and should not replace pregnancy-specific glucose monitoring.

DISCUSSION

Gestational diabetes mellitus requires timely diagnosis, effective treatment and sustained patient participation to achieve appropriate glycaemic control. Medication adherence is particularly important among women who require pharmacological treatment because persistent hyperglycaemia may contribute to adverse maternal and neonatal outcomes.

In the study population, the majority of participants were aged 26–30 years. Half of the participants had documented pre-pregnancy overweight or obesity, while 42% reported a family history of diabetes mellitus. These characteristics are clinically relevant because increased body mass index and family history are recognized risk factors for metabolic dysfunction during pregnancy.

The overall medication adherence rate was 64%, with 36% of patients classified as non-adherent. Published research has demonstrated considerable variation in adherence estimates among women with GDM, reflecting differences in study populations, treatment regimens and adherence assessment methods [5].

Insulin monotherapy was the most commonly prescribed treatment in the population. The American Diabetes Association recommends insulin as the preferred medication for managing GDM when lifestyle interventions are insufficient [1]. NICE guidelines permit metformin in selected circumstances, differences between international pharmacological recommendations [2].

The adherence rate was higher among women receiving metformin than among those receiving insulin. Oral administration may be more acceptable to some patients, whereas insulin treatment requires appropriate injection technique and integration of administration into daily activities.

Rowan and colleagues evaluated metformin compared with insulin in women with GDM, providing important evidence regarding treatment effectiveness and patient acceptability [3]. Nevertheless, medication selection should be based on individualized clinical assessment rather than adherence considerations alone.

Forgetfulness, fear of hypoglycaemia and concerns regarding fetal harm represented major barriers in the dataset. These factors highlight the importance of addressing both intentional and unintentional medication non-adherence.

Martis and colleagues identified multiple barriers and facilitators influencing glycaemic management among women with GDM, including communication difficulties, family involvement, healthcare accessibility and availability of monitoring resources [4].

Research examining the experiences of women with GDM in South India has similarly identified challenges related to emotional concerns, social relationships and access to appropriate treatment [6]. These findings emphasize the importance of culturally sensitive counselling and patient-centred healthcare.

Structured diabetes counselling was associated with higher adherence in the dataset. Education regarding medication administration, glucose monitoring, recognition of hypoglycaemia and the potential consequences of uncontrolled hyperglycaemia may improve patient confidence.

Family support and regular clinical follow-up were also associated with better adherence. Family members may assist with treatment schedules, healthcare appointments and emotional support, provided such involvement respects patient autonomy.

Adequate glycaemic control was observed in 81.3% of adherent patients compared with 44.4% of non-adherent patients in the results. Clinical trials have demonstrated the importance of treating GDM to reduce selected adverse pregnancy outcomes [7,8]. However, glycaemic control depends on multiple factors beyond medication adherence, including dietary practices, insulin resistance, treatment adequacy and gestational age.

The proposed study is limited by its cross-sectional design, single-centre recruitment and potential inaccuracies in self-reported adherence. Selection bias and residual confounding may influence associations between adherence and glycaemic outcomes.

Future prospective studies should incorporate repeated adherence measurements, objective glucose monitoring and maternal and neonatal follow-up. Interventional research evaluating pharmacist-led counselling, reminder systems and structured diabetes education may help identify effective approaches to improving medication adherence.

CONCLUSION

Medication adherence represents an essential component of effective gestational diabetes mellitus management. Patient knowledge, treatment acceptability, family support, financial accessibility and regular clinical follow-up may influence adherence behaviours.

Individualized diabetes counselling, appropriate pharmacotherapy, education regarding medication safety, support for glucose monitoring and early identification of adherence barriers may contribute to improved glycaemic control and better pregnancy outcomes.

A multidisciplinary approach involving obstetricians, endocrinologists, pharmacologists, clinical pharmacists, dietitians and nursing professionals is recommended to support comprehensive GDM management.

REFERENCES

1. American Diabetes Association Professional Practice Committee. 15. Management of diabetes in pregnancy: Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1):S306-S320.
2. National Institute for Health and Care Excellence. Diabetes in pregnancy: management from preconception to the postnatal period. NICE guideline NG3. London: NICE; 2015.
3. Rowan JA, Hague WM, Gao W, Battin MR, Moore MP; MiG Trial Investigators. Metformin versus insulin for the treatment of gestational diabetes. N Engl J Med. 2008;358(19):2003-2015.

4. Martis R, Brown J, McAra-Couper J, Crowther CA. Enablers and barriers for women with gestational diabetes mellitus to achieve optimal glycaemic control: a qualitative study using the theoretical domains framework. BMC Pregnancy Childbirth. 2018;18(1):91.
5. Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS; Australian Carbohydrate Intolerance Study in Pregnant Women Trial Group. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. N Engl J Med. 2005;352(24):2477-2486.
6. Landon MB, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B, et al. A multicenter, randomized trial of treatment for mild gestational diabetes. N Engl J Med. 2009;361(14):1339-1348.
7. Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. Lancet. 2009;373(9677):1773-1779.
8. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008;358(19):1991-2002.
9. Asiedu-Danso M, Kretchy IA, Sekyi JK, Koduah A. Adherence to antidiabetic medications among women with gestational diabetes. J Diabetes Res. 2021;2021:9941538.
10. Nielsen KK, Vildekilde T, Kapur A, Damm P, Seshiah V, Bygbjerg IC. "If I don't eat enough, I won't be healthy". Women's experiences with gestational diabetes mellitus treatment in rural and urban South India. Int J Environ Res Public Health. 2020;17(9):3062.
11. HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008;358(19):1991-2002.
12. Krishnakumar S, Govindarajulu Y, Vishwanath U, Nagasubramanian VR, Palani T. Impact of patient education on KAP, medication adherence and therapeutic outcomes of metformin versus insulin therapy in patients with gestational diabetes: a hospital based pilot study in South India. Diabetes Metab Syndr. 2020;14(5):1379-1383.
13. Mukona D, Munjanja SP, Zvinavashe M, Stray-Pederson B. Barriers of adherence and possible solutions to nonadherence to antidiabetic therapy in women with diabetes in pregnancy: patients' perspective. J Diabetes Res. 2017;2017:3578075.
14. Zhuo Y, Pan Y, Lin K, Yin G, Wu Y, Xu J, et al. Effectiveness of clinical pharmacist-led smartphone application on medication adherence, insulin injection technique and glycemic control for women with gestational diabetes receiving multiple daily insulin injection: a randomized clinical trial. Prim Care Diabetes. 2022;16(2):264-270.
15. Sahu B, Babu GR, Gurav KS, Karthik M, Ravi D, Lobo E, et al. Health care professionals' perspectives on screening and management of gestational diabetes mellitus in public hospitals of South India—a qualitative study. BMC Health Serv Res. 2021;21(1):133.
16. Brown J, Grzeskowiak L, Williamson K, Downie MR, Crowther CA. Insulin for the treatment of women with gestational diabetes. Cochrane Database Syst Rev. 2017;11(11):CD012037.
17. Balsells M, García-Patterson A, Solà I, Roqué M, Gich I, Corcoy R. Glibenclamide, metformin, and insulin for the treatment of gestational diabetes: a systematic review and meta-analysis. BMJ. 2015;350:h102.
18. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care. 1986;24(1):67-74.