DiabetesAsia Journal

Diabetes Asia Journal

Vol. 2, Issue 4, Jan 2026, ***Edition:*** *Online*
Publisher: *Diabetes Asia Journal under JHRC*
eISSN: *3048-8192*
Journal Homepage:*https://diabetesasia.org/journal/*
Cross Ref DOI:*https://doi.org/10.62996/daj.77052025*

Research Article

Medical Nutrition Therapy & Metformin in Early Gestational Glucose Intolerance to Prevent Post-Partum Diabetes Risk in a hospital Prospective Study

Shweta Verma[1], Renu Gupta[2], Neena Gupta[3], Divya Dwivedi[4], Palak Taneja[5]*

Submitted: 10 Dec 2025; Accepted: 25 Dec 2025; Published: 10 Jan 2026

Affiliation(s)

[1,2,3,4,5]Department of Obstetrics & Gynecology, GSVM Medical College, Kanpur, India.
Corresponding Author: 1*Shweta Verma, Department of Obstetrics & Gynecology, GSVM Medical College, Kanpur, India. Email: shwetaverma0101@gmail.com

Abstract

Objectives
This study examines how Medical Nutrition Therapy (MNT) and Metformin help manage early gestational glucose intolerance during the 8th-10th weeks of pregnancy, particularly when postprandial blood glucose (PPBG) is >110 mg/dL. The goal is to find out if these treatments can prevent gestational diabetes mellitus (GDM) and lower the risk of diabetes after pregnancy.

Material and Methods
A prospective cohort study was conducted at GSVM Medical Hospital in Kanpur, involving approximately 231 pregnant women at 8 to 10 weeks of gestation with pre-prandial blood glucose (PPBG) levels of at least 110 mg/dL. Participants were randomly assigned to either the MNT-Metformin group, receiving dosages ranging from 500 to 2500 mg, or the MNT-only group.

Results
At 2 to 3 days postpartum and at 6 weeks, the mean PPBG for the Metformin plus MNT group was 106.9 ± 5.24 mg/dL and 107.51 ± 10.67 mg/dL, respectively (P = 0.57). The mean HBA1c values were 4.84 ± 0.20 and 4.99 ± 0.37, respectively, with a P-value < 0.05.

Conclusion
Early detection and management of early gestational glucose intolerance (EGGI) with medical nutrition therapy (MNT) and Metformin can prevent progression to diabetes risk during postpartum screening.

Keywords: EGGI Early gestational glucose intolerance, Gestational diabetes mellitus (GDM), PPBG Postprandial blood glucose, MNT Medical Nutrition Therapy, OGCT Oral Glucose challenge Test, DIPSI diabetes in Pregnancy Study Group India.

Introduction

Gestational diabetes is a form of hyperglycemia that develops during pregnancy, with blood glucose levels that are elevated but not as high as those observed in pre-existing diabetes. Approximately 14% of pregnancies worldwide are affected by gestational diabetes [1,2]. Although this condition is relatively common and can be serious, it typically resolves following childbirth. However, gestational diabetes may have long-term consequences, increasing the risk of adverse health outcomes for both mothers and their offspring. Currently, an estimated 13.4% of pregnancies globally, representing around 17 million cases, are complicated by gestational diabetes. Both mothers and their children are at increased risk of developing type 2 diabetes and other metabolic disorders later in life. Effective management of gestational diabetes is therefore essential to safeguard maternal and child health. In South Asia, the prevalence is even higher, with 28% of pregnancies affected, according to the IDF Atlas 2021 [3-5].

Individuals of Asian genotype are more likely to exhibit elevated postprandial blood glucose levels compared to Caucasians, who tend to have higher fasting blood glucose levels [6,7]. Consequently, the Diabetes in Pregnancy Study Group India (DIPSI) has adopted the 75-gram, 2-hour oral glucose tolerance test criteria for diagnosing gestational diabetes in India [8].

Metformin safety, Efficacy in GDM

Metformin is widely used during pregnancy and is considered safe, effectively controlling blood glucose in gestational diabetes and reducing adverse maternal-fetal outcomes compared to insulin, as demonstrated by the recently concluded Clue study [9]. The European Working Group (EWG) and CDSCO India have endorsed the use of metformin from conception to delivery without reporting any adverse effects [9,10]. Additionally, metformin use has been associated with lower rates of large-for-gestational-age offspring and reduced birthweight. A meta-analysis of 13 studies using a random-effects model demonstrated that metformin intervention reduced the risk of gestational diabetes mellitus (GDM) by 34% in the pooled analysis [11]

Sampling Interventions involving dietary modification, physical activity, combined diet and physical activity, metformin, and myoinositol are associated with a reduced incidence of gestational diabetes mellitus (GDM) compared to control interventions [12]

Early prenatal check-ups, particularly during the first trimester, facilitate timely identification of pregnancy, early screening for gestational diabetes mellitus (GDM), and detection of other risk factors. This enables healthcare professionals to implement early planning, treatment, or other interventions necessary to improve pregnancy outcomes [13,14,15,16].

Methodology

This randomized cohort study took place in the Department of Obstetrics and Gynecology at GSVM Medical College, Kanpur, from February 2024 to March 2025. Researchers evaluated maternal and fetal outcomes in pregnant women using specific inclusion and exclusion criteria.

All pregnant women had a 2-hour PPBG test at 8 to 10 weeks of pregnancy, about 2 months after their last period. Women with values of 110 mg/dl or higher were included in the study. After randomization, one group received both metformin and medical nutrition therapy (MNT), while the other group received only MNT. The metformin dose was increased up to 2 grams per day, divided into several doses, to control blood glucose. OGCT was done at both 8 to 10 weeks and again at 32 weeks. PPBG tests were repeated at 12, 16, and 24 weeks. At 32 weeks, a 75-gram OGCT (DIPSI Test) was used to check for gestational diabetes. The Results were published in Peer reviewed Journal but Postpartum screening results were pending,After delivery, both groups were screened at 2 to 3 days and again at 6 weeks to assess the tests' sensitivity and specificity.

Ethical Issue

The study received approval from the Ethics Committee for Biomedical Health & Research (reference EC/BMHR/2024/01, dated January 4, 2024). All participants were informed about the study's goals and procedures, and each gave written consent. Their information was kept confidential. Participants could leave the study at any time without any negative effects. If a participant was diagnosed with gestational diabetes mellitus (GDM), she was treated following the department's standard clinical protocols. There were no extra risks for those taking part, and participation did not result in any financial costs.

Statistical Methods: Data were entered in Microsoft Excel and analyzed using SPSS version 21.0. Continuous variables are shown as means with standard deviations, and categorical variables as percentages. To compare means or medians between two groups, either the paired t-test or the Mann-Whitney U test was used, depending on the data. The independent t-test was used to compare mean values between groups. All tests were two-tailed, and a P-value below 0.05 was considered significant.

For the sample size, it was assumed that 30% of pregnant women would be at risk for gestational diabetes mellitus (GDM) with a 2-hour postprandial blood sugar (PPBS) of at least 110 mg/dl. The estimated rate of GDM among high-risk women with PPBS ⩾110 mg/dl was 14.0% (rounded from 13.7%). Based on this, 186 high-risk pregnant women (PPBS ⩾110 mg/dl) were included in the study, split into two groups: one received medical nutrition therapy (MNT), and the other received MNT plus Metformin.

Procedure:

Inclusion criteria: All pregnant women between 8 and 10 weeks of pregnancy, especially those with single pregnancies, impaired glucose tolerance (IGT), or gestational diabetes (GDM), were included to match real-life situations using the intention-to-treat method in both groups.

Exclusion criteria: Women taking Metformin for Polycystic Ovary Syndrome (PCOS) or any other reason, and those who are more than 10 weeks pregnant, were not included. A blood sugar test called the Oral Glucose Challenge Test (OGCT) was performed at 8-10 weeks to assess patients with blood sugar levels of 200 mg/dL or higher.

A prospective analytical cohort study was conducted in the Department of Obstetrics and Gynecology at GSVM Medical College, Kanpur, India. After obtaining Ethics Committee approval, pregnant women with gestational ages of 8 to 10 weeks were enrolled in the study. The participants were randomly divided into two groups. All eligible women enrolled in the study after providing written consent. A full medical history and physical exam were performed in accordance with standard procedures. Pregnancy age was estimated from the last menstrual period or an ultrasound. All women were asked to take a 2-hour blood sugar test after breakfast at 8-10, 12, 16, and 24 weeks of pregnancy. Blood sugar was measured using a plasma-calibrated glucometer, and the exact meal time was recorded. Participants were regularly checked at the antenatal clinic and tested for gestational diabetes using the DIPSI test, in accordance with guidelines from the Ministry of Health and Family Welfare, India. According to these guidelines, gestational diabetes is diagnosed if a non-fasting blood sugar level is above 140 mg/dL two hours after taking 75 g of glucose.

Results

In a study of 482 pregnant women, researchers tracked postprandial blood glucose levels at 8-10 weeks of pregnancy. Of these, 256 women had elevated levels of 110 mg/dl or higher, and 231 continued through to delivery. After accounting for 25 participants lost to follow-up, the study included 231 women, split into two groups: 123 received both Medical Nutrition Therapy and Metformin, while 108 served as the control group and received only Medical Nutrition Therapy.

This randomized, prospective cohort study closely monitored blood glucose and maternal outcomes throughout pregnancy.

Postpartum outcomes

At 2-3 days postpartum, the mean PPBG was 106.9 ± 5.24 mg/dl for the Metformin + MNT group and 106.82 ± 6.41 mg/dl for the MNT group (P = 0.91). After 6 weeks, the postpartum mean PPBG was 107.51 ± 10.67 in the Metformin group and 108.58 ± 12.31 in the MNT group, with a p-value of 0.48 (Table 1).

Screening women just 2 to 3 days after giving birth proves just as effective as waiting until 6 weeks, a crucial finding since many new mothers miss later appointments. This early window offers a practical and vital chance to catch complications before they escalate. Notably, women in the Metformin group achieved better blood glucose control, with an average HbA1c of 4.84±0.20 compared to 4.99±0.32 in the Medical Nutrition Therapy group, a statistically significant difference. Together, these findings suggest that early screening, paired with ongoing blood glucose management, could be a powerful approach to lowering the risk of future impaired glucose tolerance and Type 2 diabetes for these women. Figure 1, Table 1

Primary and other maternal-fetal outcomes

Turning to other outcomes, by the 32nd week of pregnancy, not a single woman in the Metformin plus Medical Nutrition Therapy group developed gestational diabetes, while 6 women (5.56%) in the MNT group did. The Metformin + MNT group also experienced a striking reduction in postpartum impaired glucose tolerance, with no cases reported compared to 6.5% in the MNT group. However, by the 8-10-week mark, mean glycated hemoglobin levels were similar between groups, indicating no significant difference at that point.

Results are already published during pregnancy and delivery [23].

Discussion

The Diabetes in Pregnancy study group of India has included Early Gestational Glucose Tolerance (EGGI) in its guidelines, highlighting early dysglycemia that requires attention during 8-10 weeks of pregnancy [17,18].

Building on these guidelines, it is important to recognize that a healthy pregnancy begins with the newborn's appropriate birth weight. When a newborn's weight is less than 2.5 kg or greater than 3.5 kg, they face a higher risk of developing obesity, diabetes, hypertension, and cardiovascular disease (NCDs) in adulthood. These newborns are also at risk of 'Transgenerational Transmission of NCDs.' To help prevent this, it is important to maintain a plasma glucose level of 99 ± 10 mg/dl throughout pregnancy, from conception to delivery, to prevent transgenerational transmission of diabetes [19].

Given these risks, preventive measures against non-communicable diseases (NCDs) must commence during the intrauterine period. In our study, none of the participants in the Metformin combined with Medical Nutritional Therapy (Metformin MNT) Group—who received both metformin and prescribed dietary management—developed gestational diabetes mellitus (GDM) by 32 weeks, nor did they experience impaired glucose tolerance (IGT) in postpartum assessments. By contrast, among those who received dietary management alone (the MNT intervention group), 5.56% were diagnosed with GDM, and 4.63% were found to have IGT during postpartum screenings.

Several pilot studies conducted in India have reported favorable pregnancy outcomes following the use of medical nutrition therapy (MNT) and Metformin in groups diagnosed with early gestational glucose intolerance (EGGI) at 8 to 10 weeks of pregnancy with postprandial blood glucose (PPBG) levels of at least 110 mg/dl [20-25].

Limitation of study

Given that this study was conducted at a single center, larger sample sizes and multicenter studies are necessary to substantiate the findings regarding pregnancy outcomes. Nevertheless, these results may inform future research on interventions for early gestational diabetes mellitus (eGDM), initiated as early as 8 to 10 weeks, to improve disease outcomes.

Conclusion

A prospective cohort study found that screening as early as 8 to 10 weeks with PPBG levels of 110 mg/dl or higher, followed by treatment with Metformin and Medical Nutrition Therapy (MNT), led to fewer primary composite neonatal outcomes, less gestational diabetes during pregnancy, and lower rates of postpartum IGT conversion. These results suggest this approach may help prevent gestational diabetes in pregnant women and reduce future diabetes risk.

Conflicts of interest: None. All authors confirm that they have not had any financial relationships in the past 3 years with organizations that may be interested in this work.

Funding: The study and its publication did not receive any funding from any source, institution, or pharmaceutical company.

References:

1. Sweeting A, Hannah W, Backman H, Catalano P, Feghali M, Herman WH, Hivert MF, Immanuel J, Meek C, Oppermann ML, Nolan CJ, Ram U, Schmidt MI, Simmons D, Chivese T, Benhalima K. Epidemiology and management of gestational diabetes. Lancet. 2024 Jul 13;404(10448):175-192. doi: 10.1016/S0140-6736(24)00825-0

2. Wang H, Li N, Chivese T, et al. IDF diabetes atlas: global and regional estimate of gestational diabetes mellitus prevalence for 2019-2021 by the International Association of Diabetes in Pregnancy study group's criteria. Diabetes Res Clin Pract 2022; 183: 109050. doi: 10.1016/j.diabres.2021.109050

3. International Diabetes Federation.IDF Diabetes Atlas, 11th edn. Brussels, Belgium: 2025. Available at: https://diabetesatlas.org

4. Murray SR, Reynolds RM. Short- and long-term outcomes of gestational diabetes and its treatment on fetal development. Prenat Diagn. 2020; 40: 1085-1091. doi: 10.1002/pd.5768

5. Sheiner E. Gestational Diabetes Mellitus: Long-Term Consequences for the Mother and Child Grand Challenge: How to Move on Towards Secondary Prevention? Front Clin Diabetes Healthc. 2020 Nov 4; 1:546256. doi: 10.3389/fcdhc.2020.546256

6. Wong VW. Gestational diabetes mellitus in five ethnic groups: a comparison of their clinical characteristics. Diabet Med 2012; 29: 366-71. doi: 10.1111/j.1464-5491.2011.03439.x

7. Metzger BE, Lowe LP, Dyer AR, et al. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med 2008; 358: 1991-2002. doi: 10.1056/NEJMoa0707943

8. Thanawala U, Divakar H, Jain R, Agarwal MM. Negotiating Gestational Diabetes Mellitus in India: A National Approach. Medicina (Kaunas). 2021 Sep 6;57(9):942. doi: 10.3390/medicina57090942

9. Brand KMG, Saarelainen L, Sonajalg J, Boutmy E, Foch C, Vääräsmäki M, Morin-Papunen L, Schlachter J; CLUE Study Group; Hakkarainen KM, Korhonen P. Metformin in pregnancy and risk of adverse long-term outcomes: a register-based cohort study. BMJ Open Diabetes Res Care. 2022 Jan;10(1): e002363. doi: 10.1136/bmjdrc-2021-002363

10. CDSCO Approves Metformin Use in Pregnancy and Peri-Conceptional Phase. The Endocrinology and Metabolism Subject Expert Committee (SEC),24.10.2024; CDSCO, New Delhi

11. Bidhendi Yarandi R, Amiri M, Ramezani Tehrani F, Behboudi-Gandevani S. Effectiveness of antidiabetic agents for treatment of gestational diabetes: a methodological quality assessment of meta-analyses and network meta-analyses. J Diabetes Investig 2021; 12: 2247-58. doi: 10.1111/jdi.13603

12. Takele WW, Vesco KK, Josefson J. et al. Effective interventions in preventing gestational diabetes mellitus: A systematic review and meta-analysis. Commun Med (Lond). 2024 Apr 20;4(1):75. doi: 10.1038/s43856-024-00491-1

13. Dunne F, Newman C, Álvarez-Iglesias A, et al. Early metformin in gestational diabetes: a randomized clinical trial. JAMA 2023; 330: 1547-56. doi: 10.1001/jama.2023.19869

14. V Seshiah , Pikee Saxena , Anjalakshi C , N. Bhavatharani , Geetha Lakshmi , B Madhuri , Rajesh Jain. Treatment Early Gestational Glucose Intolerance. Diabetes Asia Journal;1(2):19-22. doi:10.62996/daj.30102024

15. Caughey AB, Nicholson JM, Washington AE. First versus second-trimester ultrasound: the effect on pregnancy dating and perinatal outcomes. Am J Obstet Gynecol 2008; 198: 703.e1-5. doi: 10.1016/j.ajog.2008.03.034

16. Cooray SD, Boyle JA, Soldatos G, et al. Development, validation and clinical utility of a risk prediction model for adverse pregnancy outcomes in women with gestational diabetes: the PeRSonal GDM model. EClinical Medicine 2022; 52: 101637. doi: 10.1016/j.eclinm.2022.101637

17. Seshiah V, Bronson SC, Balaji V, Jain R, Anjalakshi C. Prediction and Prevention of Gestational Diabetes Mellitus and Its Sequelae by Administering Metformin in the Early Weeks of Pregnancy. Cureus. 2022 Nov 15;14(11): e31532. doi: 10.7759/cureus.31532

18. Jain, Rajesh, Seshiah, Veeraswamy; Chandeshekar, A et al. Early Detection and Treatment of Impaired glucose and hyperinsulinemia in early pregnancy to prevent diabetes and cardiovascular disease in adults. Journal of Hypertension 41(Suppl 3): p e288, June 2023. DOI: 10.1097/01.hjh.0000942004.65157.06

19. Tiwari, S. Agarwal, R. Jain, P. Saxena, V. Seshiah, A. Chandraseka. An Interventional Study for Prevention of Gestational Diabetes Mellitus and its Sequelae by Administering Metformin. Diabetes Research and Clinical Practice. 2024: 209S1111459. DOI: 10.1016/j.diabres.2024.111459

20. Tiwari, S., Agarwal, S., Gupta, R, N., Dwivedi, D., Verma, S., Taneja, P., Seshiah, V., & Jain, R. Treatment of early Gestational Glucose Intolerance with Metformin reduces Primary neonatal outcomes in a hospital-based Cohort. Annals of Medicine and Medical Sciences.2024;04:104-108. https://doi.org/10.5281/zenodo.15119602

21. Seshiah V, Chandrasekar A, Saxena P, Geetha Lakshmi A, Bhavatharini N, Jain R. Hope and Scope for Diabetes-Free Generations [Internet]. Labor and Delivery from a Public Health Perspective. IntechOpen; 2025. Available from: http://dx.doi.org/10.5772/intechopen.1007448

22. V Seshiah , Pikee Saxena, Anjalakshi C , N. Bhavatharani , Geetha Lakshmi , B Madhuri , Rajesh Jain. Treatment of Early Gestational Glucose Intolerance. Diabetes Asia Journal.20241(2):19-22. https://doi.org/10.62996/daj.30102024

23. Shweta Verma, Shaily Agarwal, Renu Gupta, Neena Gupta, Divya Dwivedi, Sadhana Tiwari, Palak Taneja, V Seshiah, Priti Kumar, Rajesh Jain. Primary Maternal Neonatal Outcome with MNT Metformin in Early Gestational Glucose Intolerance (EGGI). Annals of Medicine and Medical Sciences. 2025;04(8): 678-685. https://ammspub.com/index.php/amms/article/view/241. https://doi.org/10.5281/zenodo.17348886

24. Veeraswamy Seshiah, Anjalakshi Chandrasekar, Geetha Lakshmi A, Vidya Kribanidhi, Rajesh Jain, Pikee Saxena, Bhavatharini Natrajan, Rajeev Chawla. Groundbreaking Concept for Prediction and Prevention of Gestational Diabetes Mellitus and Its Sequelae. Am J Exp Clin Res 2025;12(1):512-516

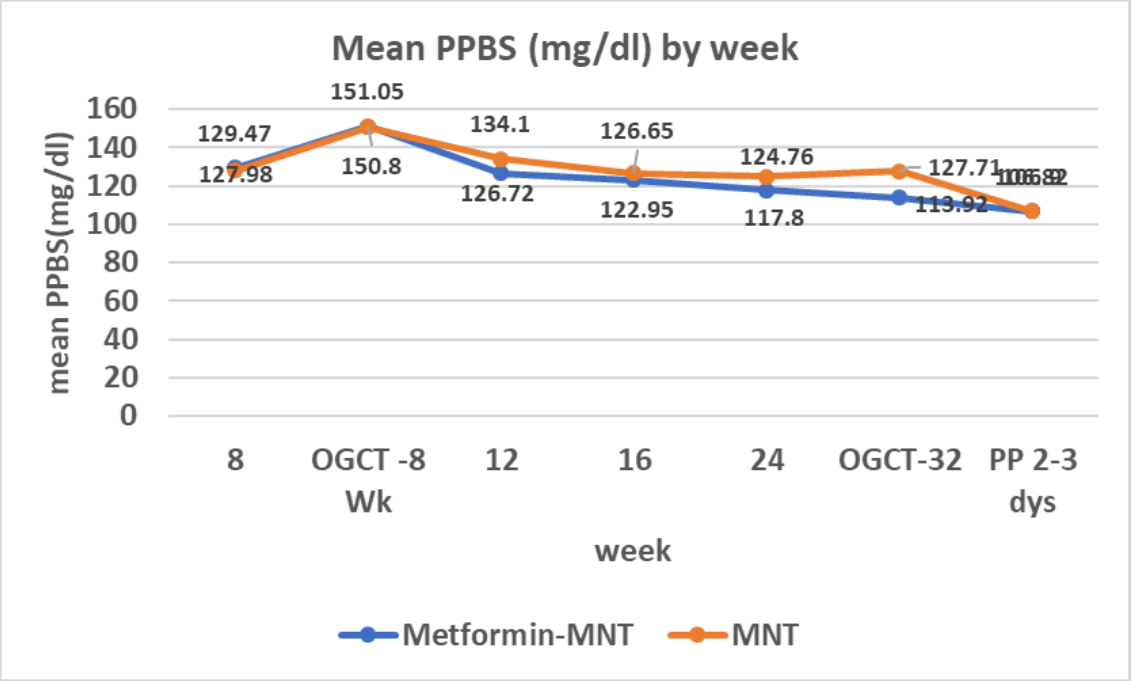
25. Sadhna Tiwari, Shaily Agarwal, Renu Gupta, Neena Gupta, Divya Dwivedi, Shweta Verma, Palak Taneja, V Seshiah, Pikee Saxena, Rajesh Jain. Management of Early Gestational Glucose Intolerance to improve Pregnancy outcomes. Am J Exp Clin Res 2025;12(1):505-511

Table 1 Maternal Hypertension and Post-Partum Diabetes Risk outcomes

Pregnancy Outcome	Post Prandial Blood Glucose	Post Prandial Blood Glucose	P-value
Maternal morbidity	**13(10.57)**	**12(11.1)**	**0.89**
+Pregnancy related	7(5.69)	7(6.48)	0.8
GHTNa	5(4.07)	5(4.62)	0.83
Severe Pre-eclampsiab	2(1.62)	2(1.85)	0.89
Hypothyroid	6(4.9)	5(4.62)	0.92
Post-Partum Care			
Post-Partum PPBG at 2-3 days	106.9 ±5.24a	106.82 ±6.41c	0.91
Post-Partum PPBG at 6 Weeks	107.51 ±10.67b	108.58±12.31d	0.48
	Pab 0.57	Pcd 0.16	
Post-Partum HBA1c at 2-3	4.84±0.20	4.99±0.37	0.00023
GDM in 32 weeks ≥140 mg/dl	0(0.0)	6(5.56)	0.008
Post-Partum IGT 140-199 mg/dl	0(0.0)	5(4.63)	0.016

* +Pregnancy related hypertension includes composite of gestational hypertension (GHTN) and preeclampsia and eclampsia; OGCT (Oral Glucose challenge Test); NICU (Neonatal Intensive care Unit); GHTN (Gestational hypertension).

Figure 2. Mean Post Prandial Blood Glucose (PPBG) level (mg/dl) during pregnancy and Postpartum



Conflict of Interest: Authors declare no conflict of Interest. Funding: No funding received.

• DOI: https://doi.org/10.62996/daj.77052025

Cite this Article: Shweta Verma[1], Renu Gupta[2], Neena Gupta[3], Divya Dwivedi[4], Palak Taneja.[5]
Medical Nutrition Therapy & Metformin in Early Gestational Glucose Intolerance to Prevent Post-Partum Diabetes Risk in a Hospital Prospective Study. Diabetes Asia Journal. 2026;2(4):63-69. https://doi.org/10.62996/daj.77052025