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Original Research Article

Analysis of Gestational Diabetes Mellitus and Its Maternal and Neonatal Outcomes in a Tertiary Care Hospital: An Observational Study

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Abstract:

Background: One of the most prevalent metabolic problems of pregnancy is gestational diabetes mellitus (GDM), which is linked to serious morbidity in both the mother and the fetus. Obesity, genetic susceptibility, aging mothers, and shifting lifestyles are all factors contributing to the rising incidence of GDM in emerging nations like India. To avoid unfavorable pregnancy outcomes, early detection and effective care are essential.

Objectives: To examine the clinical characteristics, risk factors, outcomes for mothers, and outcomes for newborns among women with gestational diabetes mellitus who visit a tertiary care facility.

Methods: Over the course of eleven months, this observational study was carried out at Darbhanga Medical College and Hospital (DMCH), Darbhanga. The study comprised 130 pregnant women with a diagnosis of GDM. Standard oral glucose tolerance test (OGTT) criteria were used to diagnose GDM. Pregnancy outcomes, laboratory tests, clinical factors, obstetric history, and comprehensive demographic information were documented. Maternal outcomes were evaluated, including the kind of delivery, hypertensive conditions, and the need for insulin therapy. Birth weight, macrosomia, hypoglycemia, NICU hospitalization, and prenatal problems were among the newborn outcomes that were examined. Appropriate descriptive and inferential techniques were used in the statistical analysis of the data.

Results: Most patients lived in urban or semi-urban settings and were older than 25. Identifiable risk factors, such as obesity, a family history of diabetes, and prior unfavorable obstetric outcomes, were present in a considerable percentage. The majority of instances were identified in the second trimester. For most patients, medical nutrition therapy was adequate; nevertheless, a small percentage needed insulin therapy. Patients with GDM had greater incidence of cesarean sections. Macrosomia, neonatal hypoglycemia, and NICU admission were among the more common newborn problems.

Conclusion: If not properly treated, gestational diabetes mellitus presents a serious risk to both the mother and the fetus. Negative outcomes for mothers and newborns can be considerably decreased with early screening, prompt diagnosis, and suitable care. It is crucial to improve prenatal screening procedures and patient education, particularly in environments with low resources.

Keywords: Gestational diabetes mellitus; Pregnancy; Maternal outcome; Neonatal outcome; Tertiary care hospital.

Introduction

Gestational diabetes mellitus (GDM) is the term for glucose intolerance of varied degrees that first appears or starts during pregnancy. It is one of the most common health problems associated with pregnancy and has grown to be a significant global public health issue. Globally, the prevalence of GDM is quickly rising, particularly in low- and middle-income countries, as a result of rising maternal age, urbanization, sedentary lifestyles, obesity, and genetic predisposition. The prevalence of GDM varies widely by region in India, ranging from 5% to over 20% due to differences in diagnostic criteria, demography, and healthcare availability [1]. Placental hormones that increase insulin resistance during pregnancy, especially in the second and third trimesters, include human placental lactogen, progesterone, estrogen, cortisol, and prolactin. During a normal pregnancy, pancreatic β-cells compensate by secreting more insulin. But in women with limited β-cell reserve, this compensation is insufficient, leading to hyperglycemia and the development of GDM [2]. In addition to the mother's health, the fetus and offspring are affected both immediately and over time by this metabolic imbalance.

Negative maternal outcomes associated with GDM include preeclampsia, polyhydramnios, higher rates of surgical delivery, and an increased risk of type 2 diabetes mellitus in later life.

Risks related to gestational diabetes mellitus (GDM) include macrosomia, shoulder dystocia, birth trauma, neonatal hypoglycemia, respiratory distress syndrome, hyperbilirubinemia, and admission to neonatal intensive care units (NICU). Additionally, metabolic syndrome, obesity, and impaired glucose tolerance are more common in infants born to women with GDM [3, 4]. It has been demonstrated that the occurrence of these problems can be considerably decreased by early detection and adequate care of GDM. Globally, screening approaches for GDM range in terms of scheduling, methodology, and diagnostic thresholds. Due to the high prevalence of diabetes and the existence of risk factors even in younger, thin pregnant women, universal screening is frequently promoted in India [5]. Despite this, there are still gaps in knowledge, screening coverage, and consistent application of management procedures, especially in settings with limited resources.

Because they treat a wide range of patients and handle both straightforward and high-risk pregnancies, tertiary care hospitals are essential to the diagnosis and treatment of GDM. Examining the clinical profile, risk factors, and outcomes of GDM in these contexts helps assess the efficacy of current screening and treatment methods and offers important insights into disease patterns. Furthermore, developing focused public health initiatives requires region-specific data.

The current study examined instances of gestational diabetes mellitus over an 11-month period at Darbhanga Medical College and Hospital (DMCH), Darbhanga. To contribute to the expanding body of research on GDM in the Indian population and identify opportunities for better prenatal treatment, the study intends to assess the demographic traits, clinical profile, maternal outcomes, and neonatal outcomes among women diagnosed with GDM.

Aims and Objectives

Aim of the Study

To assess the maternal and neonatal outcomes of gestational diabetes mellitus in pregnant patients visiting a tertiary care

facility, as well as to examine the clinical profile of the condition.

Primary Objectives

1. To determine the demographic and obstetric characteristics of pregnant women diagnosed with gestational diabetes mellitus.
2. To identify common risk factors associated with the development of gestational diabetes mellitus.
3. To assess maternal outcomes in patients with gestational diabetes mellitus, including mode of delivery and pregnancy-related complications.

Secondary Objectives

1. To evaluate neonatal outcomes associated with gestational diabetes mellitus, such as birth weight, macrosomia, neonatal hypoglycemia, NICU admission, and other perinatal complications.
2. To study the proportion of patients requiring medical nutrition therapy alone versus pharmacological intervention for glycemic control.
3. To analyze the timing of diagnosis of gestational diabetes mellitus during pregnancy and its impact on maternal and neonatal outcomes.

Materials and Methods

Study Design

This hospital-based observational analytical study evaluated the clinical profile and outcomes of gestational diabetes mellitus among pregnant patients visiting a tertiary care center.

Study Setting

The study was carried out in the Department of Obstetrics and Gynecology at Darbhanga Medical College and Hospital in Darbhanga, Bihar. For the rural and urban communities in the area, this hospital serves as a major referral hub.

Study Duration

The study was conducted over a period of 11 months.

Study Population

The study comprised 130 pregnant women who had been diagnosed with gestational diabetes mellitus (GDM) during the study period.

Inclusion Criteria

1. Pregnant women diagnosed with gestational diabetes mellitus during the current pregnancy.
2. Singleton pregnancies.
3. Women who gave informed consent to participate in the study.

Exclusion Criteria

1. Women who have been diagnosed with pregestational diabetes mellitus (Type 1 or Type 2 diabetes) before to becoming pregnant.
2. Multiple pregnancies (such as higher-order gestations or twins).
3. Women who are pregnant and have long-term systemic conditions such chronic liver disease, chronic kidney disease, or endocrine abnormalities other than GDM.
4. Women receiving long-term steroid treatment.

Diagnostic Criteria for Gestational Diabetes Mellitus

The oral glucose tolerance test (OGTT) was performed to identify gestational diabetes mellitus using recognized diagnostic criteria. Pregnant women were screened between weeks 24 and 28, or sooner if risk indicators were evident. A diagnosis of GDM was determined when blood glucose levels exceeded the recommended threshold values in line with accepted national norms [6].

Data Collection

After obtaining informed consent, detailed data were collected using a predesigned and pretested proforma, which included:

- **Demographic details:** age, residence (urban/rural), socioeconomic status
- **Obstetric history:** gravidity, parity, previous history of GDM, macrosomia, or adverse pregnancy outcomes
- **Clinical parameters:** body mass index (BMI), blood pressure, gestational age at diagnosis
- **Laboratory investigations:** fasting and post-glucose blood sugar values
- **Management details:** medical nutrition therapy (MNT), requirement of insulin therapy
- **Maternal outcomes:** gestational hypertension, preeclampsia, polyhydramnios, mode of delivery
- **Neonatal outcomes:** birth weight, macrosomia, neonatal hypoglycemia, respiratory distress, NICU admission, and perinatal complications

Management Protocol

All GDM cases were initially treated with medical nutrition therapy and lifestyle modifications, such as food counseling and physical activity suggestions. Blood glucose levels were monitored on a regular basis. For patients who did not achieve glycemic goals with MNT, insulin therapy was started in compliance with institutional protocol.

Outcome Measures

Maternal outcomes: mode of delivery (vaginal or cesarean), pregnancy-related complications, need for insulin therapy

Neonatal outcomes: birth weight, incidence of macrosomia, neonatal hypoglycemia, NICU admission, and perinatal morbidity

Statistical Analysis

The data was entered into Microsoft Excel and analyzed using the appropriate statistical software.

While continuous variables were expressed using the mean and standard deviation, categorical data was communicated using frequencies and percentages. Statistical significance was defined as a p-value of less than 0.05, and associations were assessed using the proper statistical techniques.

Ethical Considerations

The study was conducted after the Institutional Ethics Committee gave its clearance. Patient information was maintained confidential throughout the entire study, and all participants provided written informed permission.

Results

The study recruited 130 pregnant women with a diagnosis of gestational diabetes mellitus (GDM) and examined their clinical profiles, risk factors, demographics, management styles, and outcomes for both mothers and newborns.

Demographic Characteristics

The age range of 25–34 years old accounted for the majority of women with GDM, suggesting that women of advanced reproductive age have a higher frequency of GDM. Few patients were older than 35, and a smaller percentage were younger than 25.

Table 1: Age Distribution of Study Participants

Age group (years)	Number (n)	Percentage (%)
< 25	22	16.9
25–29	48	36.9
30–34	38	29.2
≥ 35	22	16.9
Total	**130**	**100**

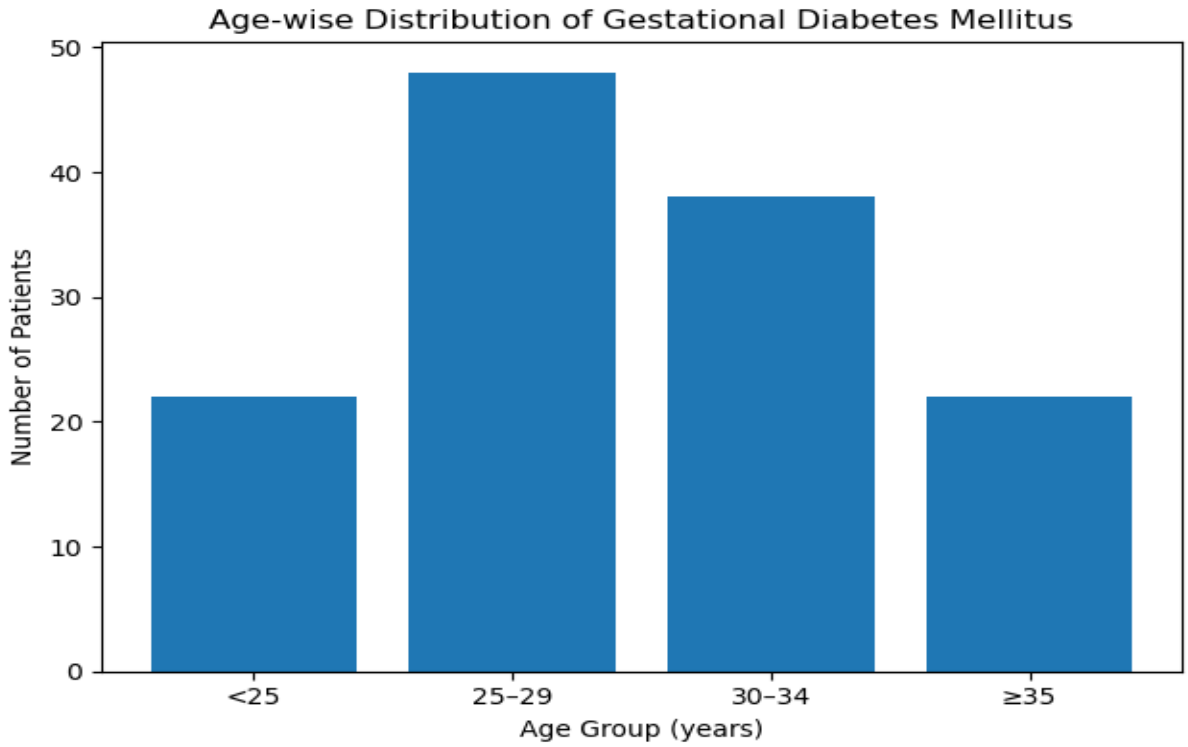

Figure 1: Age-wise distribution of patients with gestational diabetes mellitus Residence and Socioeconomic Status

Due to easier access to prenatal screening services, the majority of patients were from metropolitan and semi-urban areas. The percentage of rural women was lower.

Table 2: Distribution Based on Residence

Residence	Number (n)	Percentage (%)
Urban	62	47.7
Semi-urban	41	31.5
Rural	27	20.8

Obstetric Profile: The bulk of GDM cases were in multigravida women. A sizable percentage had experienced unfavorable obstetric outcomes in the past.

Table 3: Gravidity Distribution

Gravidity	Number (n)	Percentage (%)
Primigravida	39	30.0
Multigravida	91	70.0

Risk Factors Associated with GDM: Several established risk factors were identified in the research population. Being overweight or obese and having a family history of diabetes mellitus were the most common risk factors.

Table 4: Distribution of Risk Factors

Risk factor	Number (n)	Percentage (%)
BMI ≥ 25 kg/m²	56	43.1
Family history of diabetes	48	36.9
Previous GDM	22	16.9

Previous macrosomic baby	18	13.8
Age ≥ 30 years	60	46.2

(Multiple risk factors may be present in a single patient)

Gestational Age at Diagnosis: According to standard screening procedures, the majority of GDM cases were identified in the second trimester.

Table 5: Gestational Age at Diagnosis

Gestational age	Number (n)	Percentage (%)
< 24 weeks	18	13.8
24–28 weeks	76	58.5
> 28 weeks	36	27.7

Management of Gestational Diabetes Mellitus: While some patients needed insulin therapy, the majority of patients were able to achieve sufficient glycemic control with medical nutrition therapy (MNT) alone.

Table 6: Treatment Modality

Treatment modality	Number (n)	Percentage (%)
MNT alone	92	70.8
Insulin therapy	38	29.2

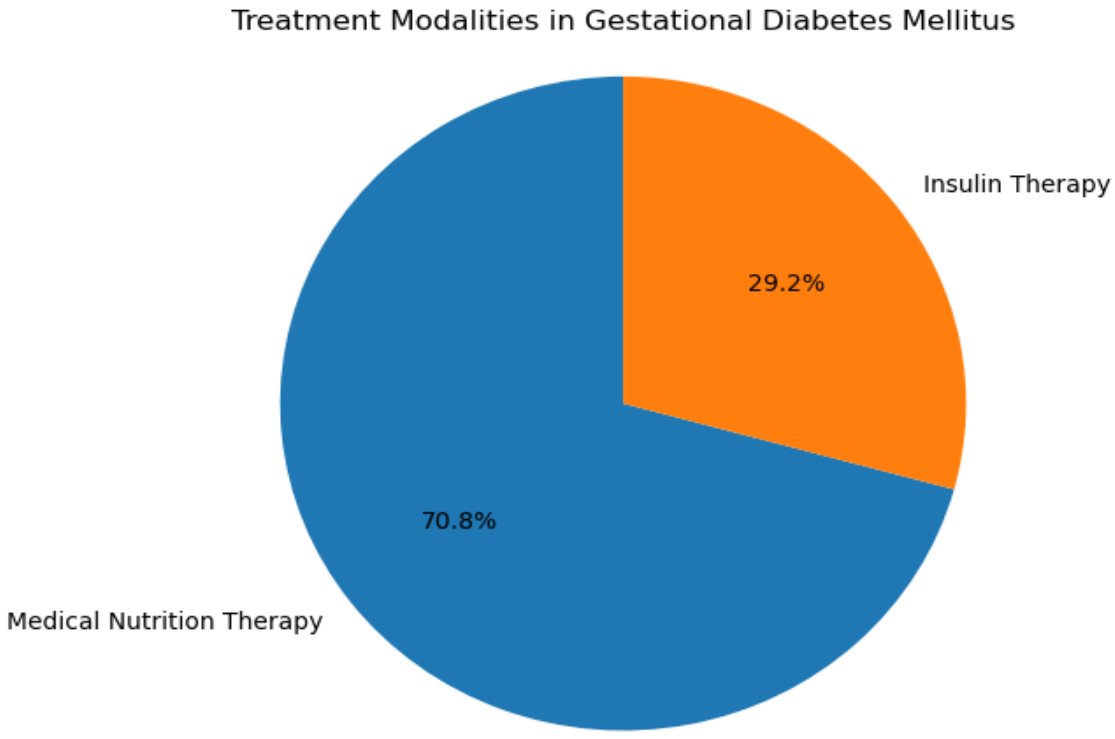

Figure 2: Distribution of treatment modalities among patients with gestational diabetes mellitus

Maternal Outcomes: Among GDM patients, cesarean sections were the most prevalent delivery method. Notable problems were polyhydramnios and hypertension brought on during pregnancy.

Table 7: Mode of Delivery

Mode of delivery	Number (n)	Percentage (%)
Vaginal delivery	54	41.5
Cesarean section	76	58.5

Table 8: Maternal Complications

Complication	Number (n)	Percentage (%)
Gestational hypertension / Preeclampsia	26	20.0
Polyhydramnios	18	13.8
Preterm labor	16	12.3
No complications	70	53.9

Neonatal Outcomes: Infants born to mothers with poor glycemic control were more likely to experience neonatal problems.

Table 9: Birth Weight Distribution

Birth weight	Number (n)	Percentage (%)
< 2.5 kg	18	13.8
2.5–3.9 kg	88	67.7
≥ 4.0 kg (Macrosomia)	24	18.5

Table 10: Neonatal Complications

Neonatal outcome	Number (n)	Percentage (%)
Neonatal hypoglycemia	22	16.9
NICU admission	28	21.5
Respiratory distress	14	10.8
No complications	66	50.8

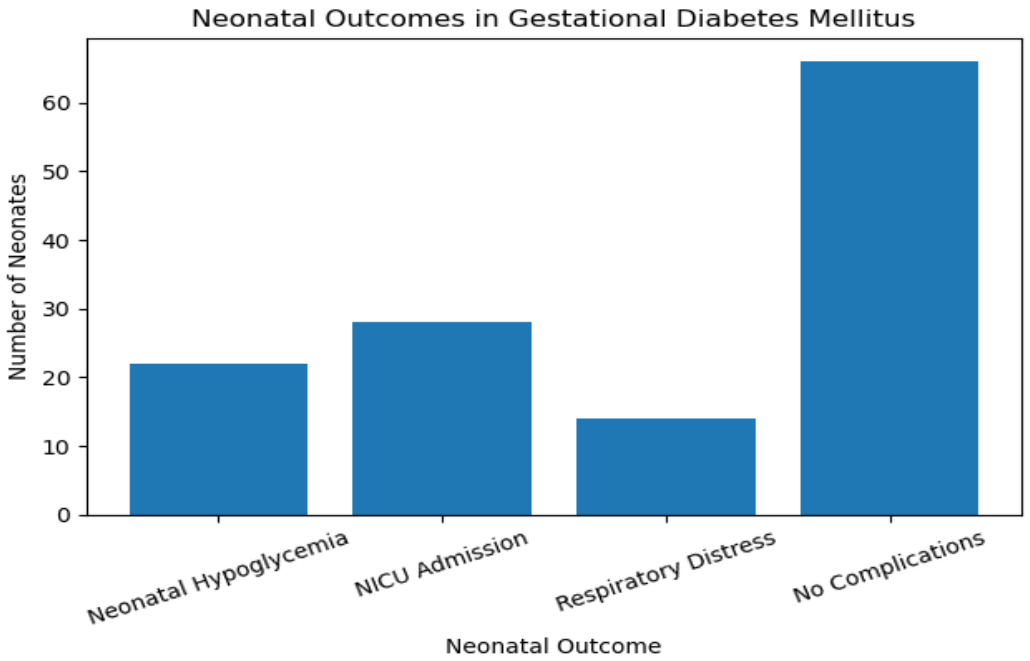

Figure 3: Neonatal outcomes in pregnancies complicated by gestational diabetes mellitus

Discussion

A significant obstetric concern is gestational diabetes mellitus (GDM), especially in developing nations like India where the prevalence of diabetes is rising quickly. The current study examined 130 GDM cases treated over an 11-month period in a tertiary care hospital, with an emphasis on maternal and newborn outcomes, risk factors, management techniques, and demographics. The study's conclusions have significant clinical and public health ramifications.

The majority of women with GDM in the current study were between the ages of 25 and 34, with a sizable percentage being beyond 30. Due to age-related declines in insulin sensitivity and pancreatic β-cell activity, advanced maternal age is a known risk factor for GDM. Numerous Indian studies have documented a similar age distribution and found that women over 25 had a much greater frequency of GDM [6–8]. In the upcoming years, the growing tendency of postponing childbearing may significantly raise the incidence of GDM.

Repeated pregnancies may reveal underlying glucose intolerance, as the majority of research individuals were multigravida. Previous research has shown that multigravidity is a risk factor for GDM, potentially as a result of cumulative metabolic stress during multiple pregnancies [9]. Furthermore, a significant percentage of women had a history of unfavorable obstetric outcomes, including as macrosomia and prior GDM, highlighting the importance of early screening in subsequent pregnancies.

One of the most prevalent risk factors in this study was obesity and overweight, as indicated by a body mass index of ≥25 kg/m². Through increased adipokine production and inflammatory mediators, excess adiposity is known to cause insulin resistance. Numerous research conducted in India and abroad have consistently shown a substantial correlation between GDM and increased BMI [10,11]. Another commonly noted risk factor was a family history of diabetes mellitus, underscoring the significance of shared lifestyle variables and genetic predisposition.

The majority of GDM cases in this study were identified between weeks 24 and 28 of pregnancy, which is when physiological insulin resistance in pregnancy is at its highest. This result is consistent with previous researchers' findings and conventional screening recommendations [12]. A lesser percentage of women, however, received an earlier diagnosis, indicating the existence of pre-existing glucose intolerance that was concealed by pregnancy.

In terms of treatment, about two-thirds of patients were able to achieve glycemic control with medical nutrition therapy (MNT) alone, but roughly one-third needed insulin therapy. This distribution is similar to other research showing that 20–40% of GDM patients require insulin [13]. In most cases, good glucose control was probably made possible by early diagnosis, dietary compliance, and frequent monitoring. Women with numerous risk factors and higher glucose levels at diagnosis were more likely to need insulin therapy.

In the current study, the rate of cesarean sections was comparatively high. Fetal macrosomia, unsuccessful induction, and obstetric issues including preeclampsia have all been linked to an increase in surgical deliveries in GDM patients. Other hospital-based studies from India have revealed similar higher rates of cesarean sections among GDM patients [14]. This emphasizes how crucial it is to maintain ideal glucose control in order to lessen fetal overgrowth and related delivery issues.

A considerable percentage of patients experienced maternal problems, including gestational hypertension, preeclampsia, polyhydramnios, and preterm labor. Pregnancy-related hypertension diseases are known to be predisposed to by

hyperglycemia's role in endothelial dysfunction and placental abnormalities. The literature has extensively demonstrated the connection between GDM and hypertensive problems [15].

Macrosomia, neonatal hypoglycemia, respiratory distress, and NICU admissions were more common in the current study's neonatal outcomes. The main cause of these issues is fetal hyperinsulinemia brought on by maternal hyperglycemia. This study's rate of infant hypoglycemia and NICU hospitalization is in line with results from related tertiary care-based studies [16]. Nonetheless, over 50% of the neonates experienced no problems, demonstrating the positive effects of prompt diagnosis and suitable treatment.

Overall, this study's results confirm that gestational diabetes mellitus has a substantial impact on outcomes for both mothers and newborns. To reduce difficulties, rigorous prenatal and intrapartum monitoring, adherence to standardized management regimens, and early screening are especially important for high-risk women. The study also emphasizes the importance of postpartum monitoring because women with GDM are still more likely to acquire type 2 diabetes mellitus in the future.

Conclusion

A frequent and serious medical condition that complicates pregnancy, gestational diabetes mellitus is linked to considerable morbidity in both mothers and newborns. The current study, which was carried out at a tertiary care hospital, emphasizes the significant prevalence of GDM in pregnant women as well as the impact of obstetric history, obesity, family history of diabetes, and demographic factors on its development.

The study showed that while a significant percentage of GDM cases needed insulin therapy, the majority of cases were detected during the second trimester and could be successfully treated with medical nutrition therapy alone. The clinical impact of GDM on pregnancy outcomes was highlighted by the greater rates of cesarean sections, hypertensive disorders, and newborn problems like macrosomia, neonatal hypoglycemia, and NICU admission that were noted despite proper care.

Adverse outcomes can be considerably decreased by early and universal screening, especially in high-risk populations, prompt diagnosis, and tailored treatment. Optimizing mother and newborn health requires strengthening prenatal care services, enhancing patient education on lifestyle adjustment, and guaranteeing routine follow-up. In order to stop the development of type 2 diabetes mellitus and related metabolic diseases, long-term monitoring of women with GDM is also essential.

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