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# "Feto maternal outcome in Pregnancy with Gestational Diabetes Mellites: An experience at a Tertiary Care Hospital"

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## ABSTRACT

**Introduction**:

Gestational diabetes mellitus (GDM) is a common metabolic syndrome and develops during the pregnancy and has dire health consequences to both the mother and the child. It has been established that the timely management of GDM has played a crucial role in reducing the adverse birth outcomes such as preeclampsia, macrosomia and perinatal hypoglycemia when identified and treated promptly. The intention of the research was to establish the feto-maternal outcome of the GDM-complicated pregnancies at Hayatabad Medical Complex, a tertiary care hospital in Peshawar, KPK.

**Objective**:

To determine maternal and neonatal outcome of gestational diabetes mellitus and determine how it can influence the feto-maternal outcome of the pregnancy.

**Material and Methods:** It was an observational prospective study that examined 100 women with GDM who had their diagnosis performed at the Hayatabad Medical Complex from June 2023 to July 2024. This data has been gathered and examined at maternal and neonatal levels in order to determine the complications rate and the effectiveness of interventions.

**Results**:

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The research conducted revealed that there were high rates of cesarean (65) section, macrosomia (30) and postnatal hypoglycemia (25). There was a correlation between poor glycemic control and the rise in the rates of complication.

**Conclusion**:

Maternal and neonatal outcomes in pregnancy complicated with GDM must be enhanced through early diagnosis, effective monitoring of the glucose level, and effective intervention, including the use of insulin.

**Keywords**:

*Gestational diabetes mellitus, feto-maternal outcomes, macrosomia, cesarean section, neonatal hypoglycemia, and blood glucose control.*

## INTRODUCTION

Gestational diabetes mellitus (GDM) is a form of metabolic disorder. It is diagnosed or first observed during pregnancy and it is described as the intolerance of glucose **(1).** The maternity age, sedentary lifestyles, and obesity have been driving the GDM up all over the world **(2).** It is also compounded by poor screening programs, lack of knowledge and poor administration action in the third world countries such as Pakistan which has caused poor feto-maternal outcomes. The early prevention and treatment of GDM is important to reduce the risks of preeclampsia, macrosomia, infant hypoglycemia and stillbirth (**3).** It is the failure of the pancreas to adjust to the elevated insulin requirements, which render the physiological insulin resistance of pregnancy pathologic in GDM **(4).** This results in maternal hyperglycemia whereby the fetus is prone to glucose excess that causes overgrowth of the fetus and complications during birth.

Studies have shown GDM to predispose the newborn and the mother in both the short-term and in the longterm. When atherosclerosis occurs in mothers, they are associated with a high risk of cesarean section, preeclampsia and subsequent type 2 diabetes **(5).** Considering children, it raises the prevalence of macrosomia, neonatal hypoglycemia, respiratory distress and subsequent obesity **(6).** Therefore, it is not just that GDM influences the result of pregnancy, but also intergenerational metabolic illness transmission. The prevention and treatment of them depends on identifying the risk factors. These generic risk factors include obesity, the

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presence of diabetes in the family history, late maternal age, the presence of GDM in the past, and polycystic ovarian syndrome **(7).** Body mass index (BMI) both pre-pregnancy and the weight gain during the pregnancy itself are important predictors of fetal development and newborn outcomes **(8).** Maternal excess weight gain may result into high insulin resistance and poor perinatal outcome. Twin pregnancy GDM is also linked to increased preterm births, hypertensive disease and admission of the newborn in the neonatal intensive care unit relative to the situation with singleton pregnancies **(9).**

The therapeutic approach to GDM added a few more issues with the outbreak of the COVID-19 virus. Several studies reported the growth of the GDM prevalence and unfavorable prognosis in the pandemic because of changes in lifestyle, decreased physical activity, and late prenatal check-ups **(10).** The presence of stress of lockdowns and the inability to receive healthcare complicated the infection itself, glycemic control, and pregnancy monitoring **(11).** Women with GDM and COVID-19 infection during pregnancy were also reported to be in danger of preterm birth, cesarean section, and neonatal complications **(12).** Moreover, dietary preferences and the extent of exercise were affected by the lockdown restrictions and this factor led to the deterioration of metabolism results indirectly **(13).** The motherliness is an important factor that determines the neonate outcome. Higher maternal serum lipid levels and especially triglycerides and low-density lipoprotein cholesterol levels are also correlated with risk of macrosomia and neonatal adiposity **(14).**

Similarly, maternal hyper ferritin has also been associated with oxidative stress and endothelial dysfunction that are included in the adverse birth outcomes of preeclampsia and low APGAR scores **(15).** The monitoring of biochemical needs to be observed with great care during pregnancy to predict and control such risks. Mild GDM and poor outcome has also been significantly investigated. It can be proved that even mild cases of hyperglycemia that are not properly addressed at the earliest stage may dispose the person to serious complications like macrosomia and even cesarean birth **(16).** However, these dangers could be reduced to a minimum, once balanced diet, exercise, and monitoring of glucose are properly managed. This highlights the significance of the early diagnosis of glucose intolerance during any stage of pregnancy and its treatment timing. The focus of preventive screening and prevention of morbidity among pregnant women and fetuses is still on early screening and intervention **(17).**

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Other recent surveys have explored GDM development, namely, during the COVID-19 lockdowns and the post-lockdowns. They found out that the GDM incidence was more prevalent during the lockdown, ostensibly due to the lack of mobility, stress, and missed physician visits, implying that the environmental and social factors can contribute to the onset and the progression of the GDM. This is a spirit of sustained surveillance and flexibility of treatment approaches in various institutions of health. Pakistan is a lower-middle-income nation where prevalence of non-communicable disorders is on the increase and presents some of the most problematic questions with regards to managing GDM. Carbohydrate- and fat-rich diets accompanied by low activity levels worsen the situation of insulin resistance in pregnant women. There are also cultural and socioeconomic factors that limit women to regular medical check-ups to develop undiagnosed cases until complications.

**Objective**:
to assess the feto-maternal outcomes of the pregnancies complicated with gestational diabetes mellitus in a tertiary care hospital.

## Materials and Methods

**Study Design: Prospective Observational study**
**Setting:** Hayatabad Medical Complex, a tertiary care hospital in Peshawar, KPK.

**Duration of Study:** June 2023 to July 2024.

**Inclusion Criteria:** The study population comprised of women with gestational diabetes mellitus in pregnancy. These subjects were found to be having GDM based on the standard 75g oral glucose tolerance test (OGTT) performed at 24-28 gestation.

**Exclusion Criteria:** Women who had diabetes mellitus (type 1 or type 2) before conception, multiple pregnancies, and any other chronic illness that could confound the outcome of pregnant women such as high blood pressure or kidney disease were excluded. Moreover, the study excluded the patients who had incomplete medical history.

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## Methods

The study has employed a highly broad approach in the collection of data on maternal and neonatal outcome of pregnancy with gestational diabetes mellitus (GDM). Ten of 100 female participants with GDM recruited to the study in Hayatabad Medical Hospital were between June 2023 and July 2024 who had taken the 75g oral glucose tolerance test (OGTT). A detailed clinical history was obtained, including age of the patient, BMI, gestation period and comorbidities. All the participants were provided with the standard antenatal care up to blood glucose monitoring. The mother outcomes were the mode of delivery, gestational hypertension, preeclampsia and post-partum complications. The neonatal outcomes were the birth weight, Apgar scores, the neonatal hypoglycemia and the hospitalization of the newborns at the neonatal intensive care unit (NICU). Descriptive statistics were applied in the data analysis to establish whether glycemic control among the mothers was related to the outcome of the pregnancy. The hospital ethics committee was approached to give the ethical approval and informed consent was taken from all participants.

## Results

The study was carried out among 100 women who were identified to have gestational diabetes mellitus (GDM) at the Hayatabad Medical Hospital from June 2023 to July 2024. The demographic and clinical variables of the subjects were quantified and their maternal and neonatal outcomes were tracked and evaluated. The average age of participants was 29.5224/4.2=29.5. Most of the women (70%), were aged 25-35 years. Most of the respondents were primigravida (58%), and 42 percent of them had had a pregnancy history. The percentage of the women with a BMI above 30 and obese was a considerable figure (45%).

**Table 1: Demographic Characteristics of Study Participants**

| Parameter | Value (%) |
|---|---|
| Age (Mean ± SD) | 29.5 ± 4.2 years |
| Primigravida | 58% |
| Obesity (BMI >30) | 45% |
| Previous Pregnancy | 42% |

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The study found out that one out of every four women had gestational hypertension and one out of every five women had preeclampsia. Most of the deliveries were done by cesarean section (65%), with the remaining (35%), having vaginal deliveries. The rate of cesarean section rose significantly in women whose blood glucose levels were poorly controlled ($HbA_1c > 6.5\%$).

**Table 2: Maternal Outcomes of GDM Pregnancies**

| Maternal Outcome | Number (%) |
|---|---|
| Gestational Hypertension | 40% |
| Preeclampsia | 15% |
| Mode of Delivery (C-section) | 65% |
| Mode of Delivery (Vaginal) | 35% |

**Neonatal Outcomes**

Neonatal birth weight was 2.5 kg - 4.8kg with an average weight of 3.7 + 0.6 kg. A large percentage (30%) proportion of babies had birth weight exceeding 4 kg, which is considered macrosomia. The incidence of neonatal hypoglycemia was 25, and 10 percent of the neonates had to be admitted to the neonatal intensive care unit (NICU) due to respiratory distress or any other complications.

**Table 3: Neonatal Outcomes**

| Neonatal Outcome | Number (%) |
|---|---|
| Birth Weight > 4 kg | 30% |
| Neonatal Hypoglycemia | 25% |
| NICU Admission | 10% |

The researchers found out that the direct cause of maternal and neonatal outcomes was maternal blood glucose regulation. The $HbA_1c$ level of more than 6.5 percent revealed more women who delivered through cesarean birth, preeclampsia, and macrosomia babies. The relationship between the level of $HbA_1c$ and frequency of cesarean sections are shown in the graph below.

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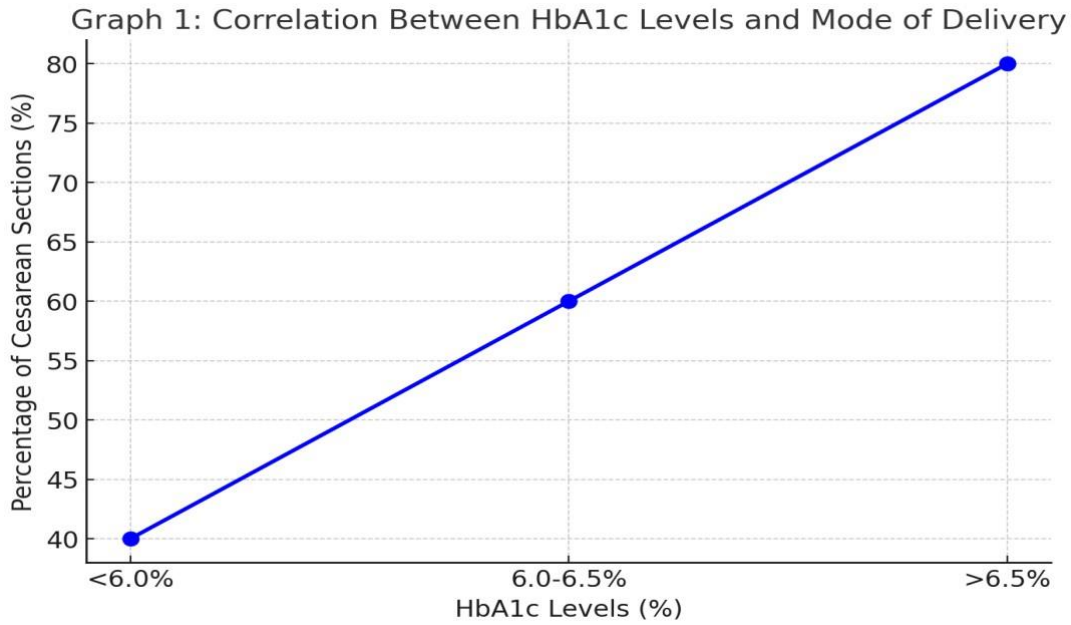
**Graph 1: Correlation Between HbA1c Levels and Mode of Delivery**




**Complications and Interventions**

Among the women with poor blood glucose, 95 percent of them required insulin and dietary interventions. There was improved maternal and neonatal outcomes associated with the use of insulin as opposed to the use of diet to manage GDM. No significant difference was however found in the rates of neonatal hypoglycemia in the insulin and diet control group.

**Table 4: Insulin Therapy and Outcomes**

| Parameter | Insulin Therapy (%) | Diet Control (%) |
|---|---|---|
| Neonatal Hypoglycemia | 26% | 24% |
| Cesarean Section | 70% | 60% |
| Neonatal Admission to NICU | 12% | 8% |

Lastly, the studies indicated that there exist significant maternal and neonatal complications associated with GDM particularly when blood glucose is not controlled. Early screening, regular follow up and other relevant measures like insulin treatment are necessary to mitigate these risks and improve pregnancy outcome.

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## Discussion

Gestational diabetes mellitus (GDM) is among the most critical health-related issues that have been affecting a larger percentage of pregnant women worldwide including Pakistan. The study findings suggest that there is more to be learned regarding maternal and neonatal outcomes of GDM and the probability of low maternal glycemic control and its consequences on maternal health and fetal development. The findings are also consistent with those reported in the literature, which suggests that GDM can cause a broad spectrum of problems, including preeclampsia, macrosomia, and neonatal hypoglycemia **(1, 2).** The implications of these findings will be discussed and compared against the findings of other studies in an effort to come up with a complete picture of the effects of GDM with reference to the direction that the pregnancy is heading. The most intriguing results of this research were the high proportion of women who had GDM and who delivered by cesarean section. The percentage of those who have delivered via a cesarean section is 65 per cent to the general population percentage of the cesarean deliveries which are less than65%.

The finding is consistent with the previous research that found that GDM preconditions the likelihood of operative births due to the presence of such issues as fetal macrosomia and obstructed birth **(3).** One of the risks factors of GDM that is known to be associated with the likelihood of cesarean section is maternal obesity **(4).** In this study, obesity was too high at 45 percent and that is the main likely reason behind high rate of cesarean section. When both combined the markedly elevated blood glucose levels ($HbA_1c$ > 6.5) caused macrosomia of the fetus rendering vaginal delivery a difficult process **(5).** The combination of GDM with the high rates of cesarean section makes it essential to pay attention to the prenatal care, monitoring and maintaining the target level of glucose, and early interventional measures. Another maternal complication that was observed in this study was preeclampsia. In patients with GDM, the preeclampsia incidence rate was 15 percent compared to 3 -5 percent in other pregnant women **(6).** The associations between GDM and preeclampsia have been widely reported with numerous studies concluding that GDM women are highly vulnerable to develop hypertensive disorders during pregnancy **(7).**

It is also believed that endothelial dysfunction, insulin resistance, and maternal hyperglycemia-induced inflammation are associated with the pathophysiology of preeclampsia in GDM **(8).** Both GDM and

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preeclampsia are associated with poor maternal morbidity and pregnancy outcome, including premature birth and fetal growth retardation. A high incidence of preeclampsia in this study only serves to drive home the point that close observation of blood pressure and other appropriate parameters in pregnant women with GDM is necessary. Results of neonatal complications in case of GDM-complicated pregnancies are also disheartening. Macrosomia, which is a birth weight more than 4 kg, was one of the most prevalent neonatal complications in this study. According to this research, the prevalence of macrosomia was 30 percent, which complies with the other literature that suggests that women with GDM have a greater likelihood of giving birth to large-for-gestational-age (LGA) babies **(9).** The raised levels of glucose in the maternal blood are transferred to the fetus where the fetus develops disproportionately, particularly in the abdominal area leading to macrosomia. Macrosomic infants pose even greater risk of birth trauma such as shoulder dystocia, bone fracture and nerve injury during birth **(10).**

These babies are more likely to acquire metabolic diseases during adulthood, including obesity and type 2 diabetes as they are subjected to abnormal glucose in the womb **(11).** The greater incidence of macrosomia among the population of this study underlines the fact that the blood glucose levels should be tightly controlled especial during the third trimester of pregnancy to reduce the excessive development of the unborn child and the associated risks. Hypoglycemia also affected the neonates in this study, as 25 percent of the infants developed the complication. Neonatal hypoglycemia occurs when the newborn infant has a blood glucose level that is unduly low at birth, typically due to the high levels of insulin released into the blood during pregnancy in reaction to the high levels of maternal glucose **(12).** The incidence of the hypoglycemia in this research is 25 percent which is comparable with other researches that show the same rates of the said condition among neonates born of mothers with GDM **(13).** Even though neonatal hypoglycemia is not always serious and can be corrected by using feeding or intravenous glucose, it can lead to serious chronic developmental issues, when not treated.

Early diagnosis and timely intervention can significantly decrease the incidence of GDM during pregnancy and would significantly lessen the incidence of neonatal hypoglycemia and other metabolic conditions in the infant **(14).** The second major finding in the study was the role of tightly controlled blood glucose levels in determining the outcome of pregnancy. Maternal $HbA_1c$ levels were analyzed and identified to be directly correlated with the high incidence of cesarean section, macrosomia and neonatal hypoglycemia. This aligns with the findings of the other researchers who have shown that tight glycemic control in pregnancy including

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the use of insulin when required can significantly improve maternal and neonatal outcomes **(15).** Insulin therapy has proven benefits in the management of GDM and when women have been treated and monitored on their glucose levels, they will more likely have a successful outcome with fewer complications such as macrosomia in the fetus and preeclampsia in the mother **(16).** However, it is important to state that even less severe instances of hyperglycemia that remain unaddressed can pose the threat of negative consequences as evidenced by the prevalence of cesarean sections and macrosomic infants in this study.

Moreover, the insulin therapy used in this research study was identified to have better maternal and neonatal results than the diet control. This observation is in line with the emerging literature that indicates that insulin treatment is a potentially useful and required intervention in the management of GDM when dietary changes alone fail to produce favorable effects **(17).** Insulin medication may also help achieve better blood glucose readings and thereby lower the risk of complications, such as, macrosomia, preeclampsia, and cesarean section (18). Nevertheless, it is to be borne in mind that the insulin therapy must be controlled and personalized to an extreme, in order to make sure that the glycemic pattern is optimal and that is why the antenatal care of women with GDM is strict.

## Conclusion

The paper references maternal and newborn morbidity which is excessive in cases of gestational diabetes mellitus (GDM) as high rates of cesarean section, preeclampsia, macrosomia and infants with low blood glucose levels. These results indicate that early diagnosis, regular measurement of the glucose level and appropriate intervention such as insulin treatment is instrumental in reducing these risks. The direct correlation between the uncontrolled instances of blood glucose levels in the course of pregnancy and the increased instances of adverse outcomes justify the importance of the proactive measures of management. Furthermore, the results indicate the importance of the discussion of such risk factors as obesity and the maturing age of a woman that contribute to the development of the GDM. The burden of GDM and comorbidities is so significant in Pakistan, early screening and education of patients, and the establishment of a unique care plan should be prioritized by healthcare providers to improve the maternal and neonatal outcomes.

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