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Maternal and Neonatal Outcomes According to Different Therapies for Gestational Diabetes Mellitus

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Abstract

Objective: The aim of this study is to evaluate and compare various maternal and newborn outcomes associated with different therapeutic approaches utilized in the management of Gestational Diabetes Mellitus (GDM).

Materials and Methods: The present investigation employed a retrospective comparative study. The study population consisted of 48 pregnant women diagnosed with GDM who gave birth at the University Hospital of Obstetrics and Gynecology 'Queen Geraldine' in Tirana, between January 2018 and December 2022. We collected the data from the medical charts of these patients. The analysis of maternal and neonatal outcomes was conducted with respect to the treatment administered, namely insulin treatment or dietary treatment. The maternal and neonatal outcomes that were assessed included birth weight, mode of delivery, gestational age at delivery, blood glucose levels in both mothers and neonates, and the Apgar score at 5 minutes.

Results: The study sample comprised a total of 48 pregnant women. There was a statistically significant difference in the mean birthweight between the two groups, with the first group having a mean birthweight of 3863g and the second group having a mean birth weight of 3300g (t 2.50682, $p < 0.007$). There was no significant statistical difference observed between the two groups in terms of the mode of delivery ($\chi 2$ 0.0274, $p<.86$), gestational age at

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delivery (36.42 weeks vs 37.07 weeks, t 0.80, p< 0.21), the mean blood sugar level in neonates (56.03 mg/dl vs 62.07 mg/dl, t 0.96, p< 0.16), and Apgar score at 5 minutes (8.53 vs 8.32, t 1.00, p-value 0.16). There was a statistically significant difference in the mean blood sugar levels between the two groups of mothers 152.52 mg/dl in the insulin treatment group and 115.67 mg/dl in the dietary treatment group, (t 1.76, p < 0.04).

Conclusion: In conclusion, our study highlights the need for a more comprehensive understanding of the implications of different therapeutic approaches for GDM, particularly in the context of maternal and neonatal outcomes. Further research is essential to delve into the complexities of this issue and provide a more accurate assessment of the effectiveness of insulin treatment in pregnancy.

Keywords: GDM, insulin treatment, neonatal outcomes.

INTRODUCTION

GDM affects approximately 14% of pregnancies worldwide and recent studies have shown a significant increase in the frequency of this health condition (1,2,3).

GDM during pregnancy is associated with an elevated risk of unfavorable maternal and neonatal outcomes, as well as a greater chance of acquiring obesity and diabetes later in life (4,5,6,7,8). The condition known as GDM, which was originally defined by O'Sullivan and Mahan in 1964 (9), is characterized by elevated blood glucose levels that are first noticed during pregnancy (10). Insulin resistance develops as a result of the physiological state of pregnancy, which produces a diabetogenic environment. As a compensatory response, this causes an increase in the activity of beta cells of the pancreas as well as an increase in the secretion of insulin (11). The production of certain hormones by the placenta, namely progesterone, cortisol, placental lactogen, prolactin, and growth hormone, is thought to have a significant impact on the development of insulin resistance, which is crucial in maintaining adequate glucose levels for the fetus (12).

MATERIALS AND METHODS

The present investigation employed a retrospective study. The study population consisted of 48 pregnant women diagnosed with GDM who gave birth at the University Hospital of Obstetrics and Gynecology 'Queen Geraldine' in Tirana, between January 2018 and December 2022.

We collected patient data by reviewing medical records. Pregnant women diagnosed with GDM initially underwent treatment through dietary adjustments and physical activity. Those who couldn't achieve normal fasting and random blood glucose levels with diet alone within one week were subsequently administered insulin.

We obtained information from the records, including details about insulin use during pregnancy, duration of insulin use, dosage, and other relevant parameters. This retrospective approach allowed us to analyze data from patient records and conduct a static-group comparison study.

The study population was divided into two groups for analysis: Group 1 received insulin treatment, while Group 2 received dietary treatment.

We analyzed maternal and neonatal outcomes with regard to the treatment administered, i.e., insulin or diet. The outcomes assessed included birth weight, delivery mode, gestational age at delivery, blood glucose levels in both mothers and neonates, and the Apgar score at 5 minutes.

Categorical variables were analyzed using the chi-square test, while continuous variables were assessed using unpaired t-tests. A significance level of $p < 0.05$ was used to determine statistical significance. We conducted the statistical analysis using the Social Science Statistics website.

RESULTS

We included in the study 48 patients with GDM who delivered at the University Hospital of Obstetrics and Gynecology of Tirana from January 2018 till December 2022.

The mean birthweight in the insulin treatment group was 3863 g and in the diet treatment group was 3300g, the difference between the two groups was statistically significant, p-value <.007 (Figure 1).

There was no statistical difference between the two groups of study regarding the mode of delivery, $\chi 2$ 0.0274, p-value 0.86 (Figure 2).

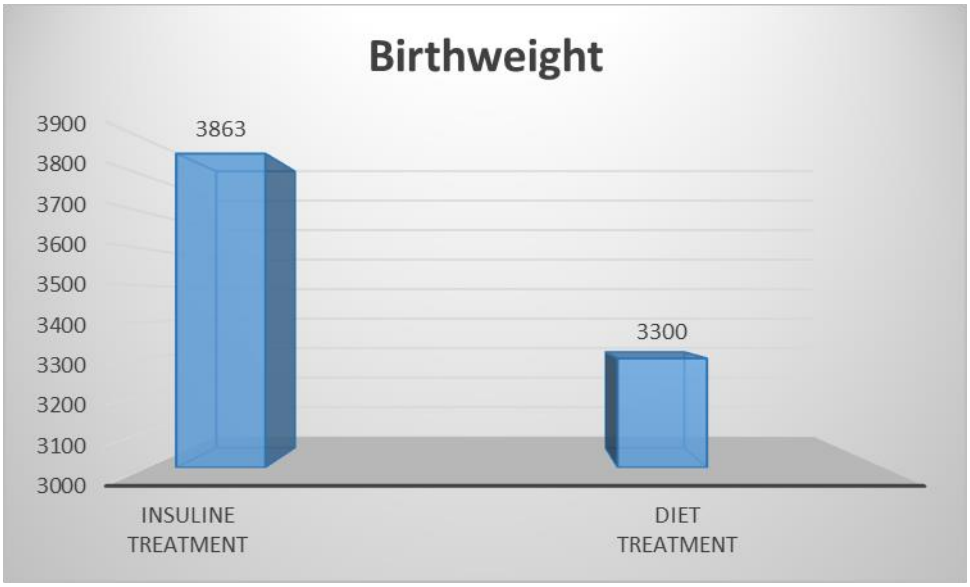

Figure 1. The Comparison of birthweight in the insulin treatment group and diet treatment group.

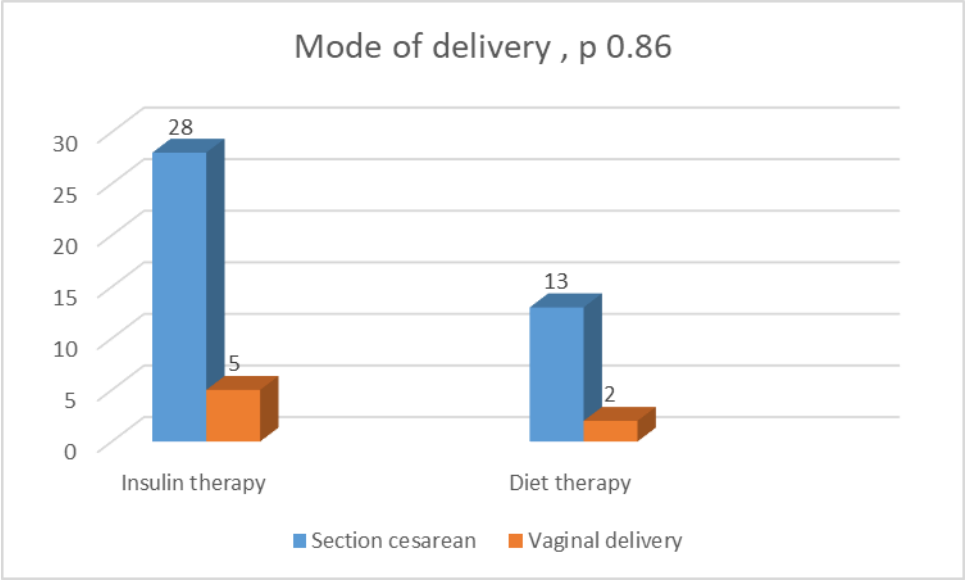

Figure 2. The comparison of mode of delivery of patients with GDM in the insulin treatment group and diet treatment group.

The mean age at delivery in the insulin treatment group was 36.42 weeks and in the diet treatment group was 37.07 weeks, the difference between the two groups wasn't statistically significant, t 0.80, p-value 0.21 (Table 1).

The mean blood sugar level in neonates of the insulin treatment group was 56.03 mg/dl and in neonates of the diet treatment group was 62.07 mg/dl. The difference between the two groups wasn't statistically significant, t 0.96, p-value 0.16 (Table 2).

The mean blood sugar levels in mothers with GDM of the insulin treatment group was 152.52 mg/dl and in mothers of the diet treatment group was 115.67 mg/dl, the difference between the two groups was statistically significant, t 1.76, p-value 0.04 (Figure 3).

Table 1. The comparison of gestational age at delivery of patients with GDM in the insulin treatment group and diet treatment group

	insulin treatment group	diet treatment group
Gestational age at delivery	36.42 weeks	37.07 weeks

Table 2. The comparison of blood sugar levels in the neonates of mothers with GDM in the insulin treatment group and diet treatment group

	insulin treatment group	diet treatment group
Gestational age at delivery	56.03 mg/dl	62.07 mg/dl

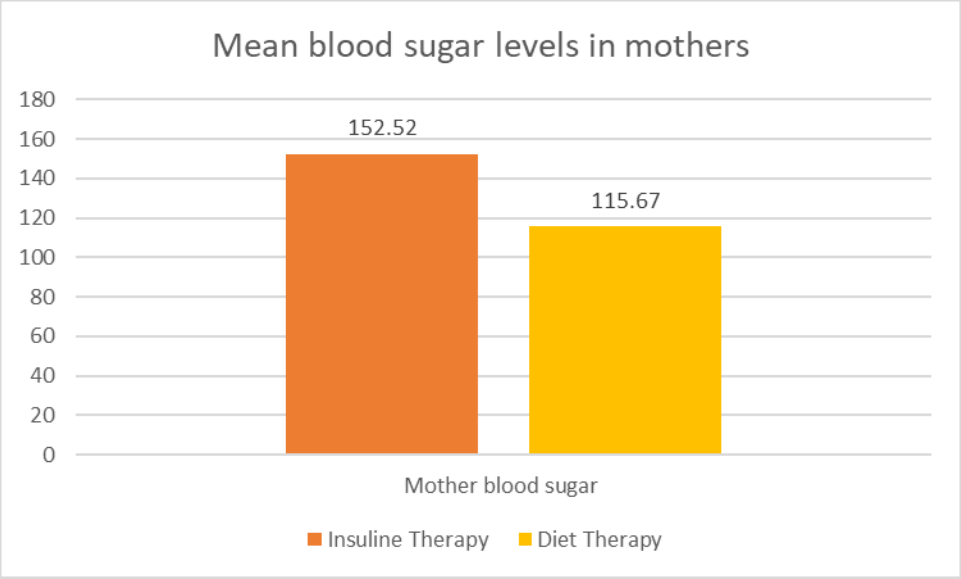

Figure 3. The comparison of mean blood sugar levels in mothers with GDM of insulin treatment group and diet treatment group

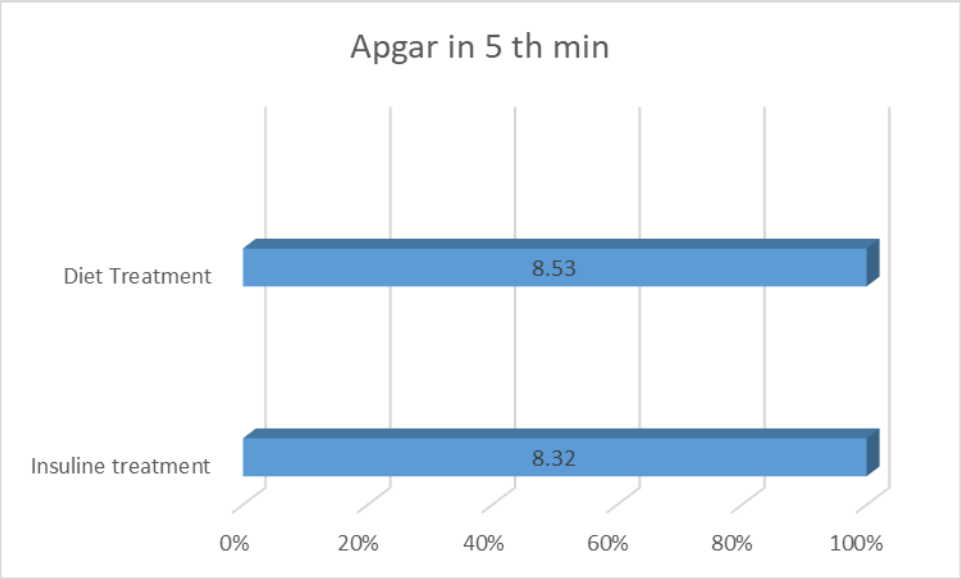

Figure 4. The comparison of mean Apgar value at 5 min in the neonates of mothers with GDM in the insulin treatment group and diet treatment group

DISCUSSION

It has been demonstrated that a hyperglycemic state is a toxic environment for a developing fetus, and it is frequently associated with negative consequences for neonates (13,14).

A higher risk of perineal tears, uterine atony resulting in postpartum hemorrhage, and an emergency cesarean section exists in mothers who have poor glycemic control (15). The complications of fetal macrosomia, such as shoulder dystocia and the need for an operative vaginal delivery, are more likely to occur in newborns (16,17).

According to our study, there is a link between maternal GDM and newborn weight. When taking into consideration that maternal GDM exposes the fetus to significantly elevated levels of glucose throughout pregnancy, it is expected that newborns of mothers with GDM have a higher birth weight than those born to mothers without GDM (15). It is possible for newborns to develop macrosomia as a result of prolonged exposure to glucose (16).

The group that was treated with insulin had a higher mean birthweight than the group that was treated with diet, and the difference in birthweight between the two groups was statistically significant. In the study by Gandhi et al. (18), similar findings to ours were presented. Otherwise, in Simeonova-Krstevska's study, the mean birthweight was lower in the insulin group compared to the diet treatment group (19).

Despite the fact that the insulin treatment group had a higher rate of cesarean births than the diet group did, we didn’t detect a statistically significant difference in the mode of delivery between the two groups. Only elective cesarean sections were significant, according to Koning et

al. They did not find significance for the overall number of cesarean sections (20). Simeonova-Krstevska also discovered that the delivery method differed significantly between the two groups (19). The higher rate of cesarean section in the insulin group most likely resulted from the greater prevalence of LGA newborns in that population. It's important to emphasize that variations in gestational age and birthweight are influenced by a multitude of complex factors, necessitating a comprehensive consideration of other clinical aspects.

Even though the insulin group's average gestational age at delivery was lower, our research showed that this difference did not reach statistical significance. Our data are comparable to those of Balani et al. and Goh et al., who presented the same conclusions (21,22).

While there was a trend toward lower mean blood sugar levels in the neonates of the insulin treatment group, the difference between them and the neonates of the diet treatment group was not statistically significant. Afshari et al. discovered outcomes that were similar to ours (23).

The difference in mean fasting glucose levels between the diet treatment group and the insulin treatment group was statistically significant, and it showed that the insulin treatment group had significantly higher fasting glucose levels than the diet treatment group did. Simeonova-Krstevska and Afshari both presented results that were quite comparable with ours (19,23).

When compared, we discovered that the insulin treatment group had a lower mean APGAR score at 5 minutes compared to the diet treatment group. Yeagle et al. presented the same findings in their study (24).

Numerous studies have examined the effects of pregestational diabetes mellitus, gestational diabetes, and Apgar scores on neonatal outcomes. In the study conducted by Mitrovi, 94 patients with GDM and 14 patients showed lower 1-minute and 5-minute Apgar scores as well as an increased incidence of perinatal morbidity of neonates when compared to neonates of mothers without impaired glycemic control (25).

The use of retrospective comparative study in this study is one of the potential theoretical limitations of the investigation. This could have led to a lack of information from variables in previously existing medical and birth records; however, the majority of the medical and birth records that were included in our research were comprehensive.

CONCLUSION

This study has unveiled significant variations in neonatal and obstetric outcomes among women diagnosed with GDM who underwent either diet-only treatment or received supplementary insulin. While our findings do indicate a significant difference in the mean blood glucose levels of mothers, it's essential to underscore that this discrepancy demands special attention. Additionally, the glucose levels in patients receiving insulin treatment were significantly higher compared to those in the diet group, where levels remained within the normal range. This

observation raises pertinent questions about the effectiveness of insulin use during pregnancy, which merits further exploration.

The normalization of maternal glycaemia, as evidenced by lower blood glucose levels in diet-treated patients, holds the potential to yield improved outcomes for both mothers and neonates. The implications of these findings are nuanced and underscore the importance of considering multiple factors when assessing the impact of treatment approaches for GDM during pregnancy.

In conclusion, our study highlights the need for a more comprehensive understanding of the implications of different therapeutic approaches for GDM, particularly in the context of maternal and neonatal outcomes. Further research is essential to delve into the complexities of this issue and provide a more accurate assessment of the effectiveness of insulin treatment in pregnancy.

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Conflict of Interest Statement: The authors declare that they have no conflict of interest.

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