ORIGINAL ARTICLE

SONOGRAPHIC EVALUATIONS OF THE EFFECTS OF MATERNAL GESTATIONAL DIABETES ON FETAL GROWTH AND DEVELOPMENT DURING THIRD TRIMESTER OF PREGNANCY

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ABSTRACT

Objective: To determine the role of ultrasound in detecting congenital abnormalities in fetus complicated with maternal gestational diabetes.

Material & Methods: A retrospective study was conducted on patients presenting with gestational diabetes mellitus at Fatima Memorial Hospital Shadman, Lahore. The study was conducted from August 2024 to December 2024. The sample size was 59. A self-designed proforma was used for data collection. Women with gestational diabetes, aged 18-45 years, were included in this study.

Results: Mean age of participants was 32 years with age range 18 to 45 years. 40 (67.79%) were detected with fetal congenital abnormalities. Out of these 40 patients, 13(32.5%) were found to have macrosomia, 4(10%) were found to have growth restriction, 7(17.5%) were found to have fetal death, 2(5%) were found to have respiratory distress syndrome, and 14(35%) were found to have premature baby.

Conclusion: Ultrasound is the best imaging modality in the diagnosis of fetal congenital abnormalities in patients with maternal gestational diabetes mellitus complication.

Key Words: Fetus, Pregnancy, Ultrasound, Women.

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INTRODUCTION

Any degree of glucose hypersensitivity with inception in the time of pregnancy is known as Maternal Gestational Diabetes Mellitus (GDM). This condition is interrelated with high risk of harmful pregnancy effects such as irregular intrauterine growth, complicated deliveries including fetal death, macrosomia, respiratory distress syndrome, hypoglycemia, hyperbilirubinemia and as well start of maternal type 2 diabetes and heart problems after pregnancy.[1] The standard diagnostic method for gestational diabetes mellitus globally is the 75g oral glucose tolerance test, typically administered during the late second trimester , specifically between the 24th and 28th gestational weeks of pregnancy.[2] This study is based on the premise that pregnant individuals with gestational Diabetes mellitus are at increased susceptible to pregnancy complications as well as adverse fetal outcomes.[3] This study aimed to develop and refine a technique for quantify fetal body composition , including muscle and adipose tissue using fetal ultrasound assessments and statistical models, validated by neonatal comprehensive electrical conductivity analysis of lean mass among infants born to mothers with pregnancy-induced glucose intolerance.[4] Macrosomia is exhibits a birth weight concerning 4000 grams or more is one of the common prenatal problems.[5] Shoulder dystocia, although an uncommon occurrence, poses a significant risk and is a severe complication during childbirth.[6]

Diabetes in pregnancy, whether gestational or pre-existing are more prone to delivery complications such as macrosomic (High birth weight percentile) due to increased fetal growth driven by excess glucose levels.[7] Women with gestational Diabetes mellitus, reduced insulin sensitivity results in increased levels of both plasma insulin and glucose levels in the bloodstream.[8] Women diagnosed with gestational diabetes mellitus present with significantly increased susceptibility to onset of predisposition to adult-onset type 2 diabetes.[9] Obese pregnant individuals face a substantially heightened risk of acquiring gestational diabetes mellitus with a 1.3 to 3.8-fold higher risk relative to women with a normal body mass index.[10] During human embryo implantation, the inner cell mass segregates into the embryoblast, which eventually forms the fetus, while the trophoblast develops into placental tissues. The amniotic sac, a fluid-filled cavity, forms from the epiblast layer of the embryoblast and surrounds the developing embryo, providing a protective environment. The amniotic sac is indeed lined by an epithelial layer, the amnion, which plays a crucial role in fetal development and protection.[11] Throughout the 10th to 20th week of pregnancy, amniotic fluid levels progressively expand, reaching nearly 400ml from an initial volume of around 25ml.[12] Amniotic fluid levels encompassing the fetus precisely maintained through a delicate balance between production and uptake mechanisms.[13] Newborns of mothers with gestational diabetes mellitus are more susceptible to complications of neonatal morbidity, including respiratory distress syndrome. Notably, these newborns frequently experience macrosomia, with a higher incidence of large for gestational age (LGA) rather than small for gestational age (SGA). Additionally, for diabetic pregnancies where the ultrasound-estimated fetal weight (EFW) exceeds 4500 grams, a cesarean section is often recommended to mitigate risks associated with macrosomia, such as birth trauma and complications during delivery.[14] The etiology of gestational diabetes mellitus is thought to involve a complex interplay between genetic susceptibility, inflammatory cytokine imbalance, disrupted adipokine signaling and obesity-related factors. Children born to mothers with gestational diabetes mellitus face higher likelihood of developing long-term health issues, including early-onset obesity, cardiovascular disease and type 2 diabetes.[15]

Pregnancies complicated by gestational diabetes mellitus are associated with a higher risk of adverse pregnancy outcomes, including fetal loss and premature birth. Furthermore, their infants are more likely to experience perinatal complications, including perinatal asphyxia and birth injuries.[16] Ultrasound has become the definitive method for determining fetal size, utilizing fetal growth indices to accurately evaluate fetal development.[17]

MATERIAL AND METHODS

A retrospective study was conducted on patients presenting with gestational diabetes mellitus at Fatima Memorial Hospital Shadman, Lahore. The study was conducted from August to December 2024 after the approval of the synopsis from Institutional Review Board. The sample size was 59. The sample size was selected using 5% level of significance, 5% margin of error, p value of 0.04 and 95% confidence interval. Non-probability convenient sampling technique was used in this study. A self-designed proforma was used for data collection. Women with gestational diabetes aged 18-45 years, were included in this study. All patients underwent ultrasonography. Data was entered and analyzed using SPSS version 26. Continuous variables were expressed as mean ± SD, whereas categorical variables in the form of frequency and percentage.

RESULTS

A total of 59 patients were included in the study. Mean age of participants was 32 years with age range 18 to 45 years. 40 (67.79%) were detected with fetal congenital abnormalities. The patients had gestational ages between 28 to 39 weeks. **(Table 1)** Out 40 patients with fetal abnormalities, 13(32.5%) were found to have macrosomia, 4(10%) were found to have growth restriction, 7(17.5%) were found to have fetal death, 2(5%) of were found to have respiratory distress syndrome, 14(35%) were found to have premature baby. Out of 40 patients, 13 were with macrosomia and 27 were without macrosomia. Out of 40 patients, 4 were with growth restriction and 36 were without growth restriction. Out of 40 patients,7 was with fetal death and 33 were without fetal death. Out of 40 patients, 2 were respiratory distress syndrome and 38 were without respiratory distress syndrome. Out of 40 patients, 14 were with premature baby and 26 had no premature baby. **(Figure 1)**

Table 1: Descriptive Statistics of gestational age

Total	Minimum	Maximum	Mean	Std. Deviation
59	28 Weeks	39 Weeks	33.95	3.224

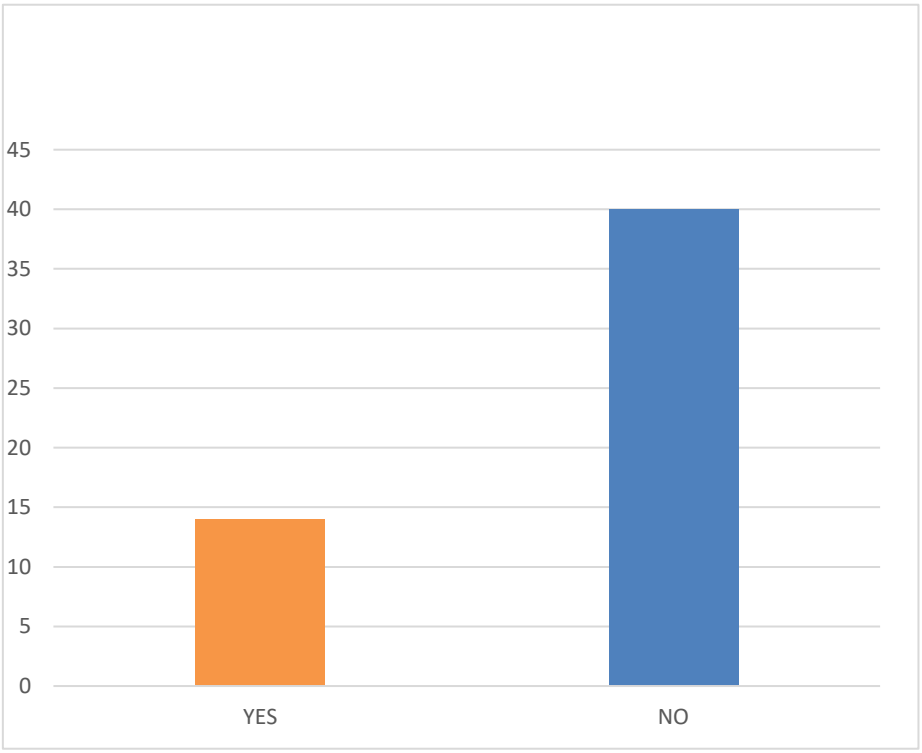

Figure 1: Frequency of premature baby

DISCUSSION

Gestational diabetes mellitus increases the risk of many neonatal complications including hypoglycemia, hyperbilirubinemia, hypocalcaemia, polycythemia, respiratory distress syndrome. Ultrasound is the most effective non-invasive method for measuring effects of gestational diabetes mellitus on fetal growth and development during pregnancy, utilizing the fourth quadrant technique. In the study, there were 59 patients of maternal gestational diabetes underwent Ultrasonography. The mean age of patients were 33.12 years. A 13 with macrosomia out of 55 if mother had maternal gestational diabetes. According to a previous study, the most frequent complication was macrosomia 27(45%) and 12(20%) have not fetal complication with gestational diabetes mellitus.[18] In this study, among the 59 patients with maternal gestational diabetes had fetal growth retardation in 4, and 14 were premature babies. There were 2 babies with respiratory distress syndrome who's mothers with maternal gestational diabetes. In a previous study gestational diabetes were associated with small head circumference, femur length and estimated fetal weight was evident between parous mothers, with 28%, 34%, 26% higher risks.[19] In this study, the Ultrasonography is useful modality in gestational diabetes mellitus and gave its complications. It showed that the fetal congenital abnormalities in maternal gestational diabetes. Previous studies also reported the role of ultrasonography in pregnancies complexed by gestational diabetes mellitus, particularly the role of ultrasonography in evaluating the fetal weight lies mainly to rule out the diagnosis of macrosomia that can help to eliminate the maternal complications during delivery.[20,21]

CONCLUSION

In the study, out of 59 patients, 40 patients were detected with fetal congenital abnormalities out of which 32.5% were complicated with macrosomia, 10% with growth restriction, 17.5% with fetal death, 5% with respiratory distress syndrome, 35% with premature death and 19 were normal with maternal gestational diabetes. Ultrasound is the best imaging modality in the diagnosis of fetal congenital abnormalities in patients complicated with maternal gestational diabetes mellitus.

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