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CORRELATION BETWEEN AMNIOTIC FLUID VOLUME, MATERNAL GLUCOSE LEVELS, NEONATAL BIRTH WEIGHT INPREGNANCY COMPLICATED WITH GESTATIONAL DIABETES MELLITUS, GESTATIONAL IMPAIRED GLUCOSE TOLERANCE, NORMAL PREGNANT MOTHERS AND PERINATAL OUTCOME

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ABSTRACT

Introduction: Pregnancies complicated by diabetes are frequently characterized by an increased volume of amniotic fluid, and the pathophysiologic mechanism of this increase is not known. Our goal was to evaluate the relationship between maternal blood glucose levels and the amniotic fluid volume in pregnancies complicated by gestational diabetes or impaired glucose tolerance and to compare it with that seen in normal pregnancies. **Methodology:** This study was done as a prospective Cohort study for period of eighteen months, about 200 pregnant women attending Antenatal clinic in Tirunelveli medical college & hospital from around Tirunelveli district in period of 18 months was studied. Pregnant women with singleton gestation, and gestational age of >20weeks, who found to have gestational diabetes mellitus, gestational impaired glucose tolerance and age ≥ 18 years were included in the study. They were divided into three groups, Gestational diabetes mellitus, gestational impaired glucose tolerance, and normalpregnancy according to the result of glucose tolerance test (GTT), All women willhave GTT at 24-28weeks, when they have positive GTT, they will be required to have Amniotic fluid volume at 36 weeks, maternal fasting blood glucose levels,and they will be followed till to delivery and neonatal birth weight will be correlated to study the relationship between these indices. Statistical analysis of linear regression will be done on these indices, Also delivery and perinatal outcome in terms of neonatal morbidities are also studied. **Results:** The mean amniotic fluid volume was significantly increased in the diabetes group. The blood glucose concentration was also significantly greater in the diabetes group than in the control group. The mean fasting blood glucose concentration among the women with diabetes was also significantly. **Conclusion:** Pregnancy complicated with Diabetes mellitus carries significant risks for both mothers and infants, since outcome of such pregnancy remains substantially worse than that of general gestational population. GDM, uncontrolled hyperglycaemia will increases the risk of preeclampsia, ceaserean delivery, future type 2 diabetes, in the mothers while In fetus or neonates, it is associated with higher rates of perinatal morbidity, macrosomia, respiratory distress, neonatal hypoglycaemia. Various studies confirmed on the importance of treatment and perinatal care ofdiabetic mother to ensure optimal control of their blood glucose levels in order tolower severe perinatal outcomes among infants.

KEYWORDS: Gestational diabetes, impaired glucose tolerance, pregnancy.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of hyperglycemia that is recognized for the first-time during pregnancy. This definition includes cases of undiagnosed type 2 diabetes mellitus (T2DM) identified early in pregnancy and true GDM which develops later. GDM constitutes a greater A1impact on diabetes epidemic as it carries a major risk of developing T2DM to the mother and foetus later in life. Also GDM has been linked with cardiometabolic risk factors such as lipid abnormalities, hypertensive disorders and hyperinsulinemia. These might result in later development of cardiovascular disease and metabolic syndrome. The understanding of the different risk factors, the pathophysiological mechanisms and the genetic factors of GDM, will help us to identify the women at risk, to develop effective preventive measures and to provide adequate management of the disease. Clinicaltrials have shown that T2DM can be prevented in women with prior GDM, by intensive lifestyle modification.

Xu ZM et al[1] studied the correlation between amniotic fluid glucose concentration and amniotic fluid volume and neonatal birth weight in pregnancy complicated by gestational diabetes mellitus and concluded that The

mean AFG in group GDM was significantly greater than that in group IGT and that in normal group. There were significant differences among three groups, The NBW of group GDM was lower than that of group IGT and higher than that of normal group, but there were no significant differences among three groups ($P > 0.05$), there were correlations between AFG, AFI, and NBW. The results show that an active management could significantly improve the prognoses of the diabetes mothers and their fetuses

Similarly, Kofinas A et al[2] studied Differences in amniotic fluid patterns and fetal biometric parameters in third trimester pregnancies with and without diabetes. This study provides gestational age-specific values of the AFI in normal and diabetic pregnancies. Diabetic pregnancy has greater AFI values than normal pregnancy between 27 and 42 weeks. The AFI correlates to the percentile of the estimated fetal weight and the abdominal circumference in both groups, suggesting that there may be a relationship between increased AFI and large for gestational age fetus independent of diabetes.

Also, Alam M et al[3] studied the Neonatal complications in infants born to diabetic mothers - The results of this study show a high incidence of complications in IDMs. The diabetic mothers should have regular antenatal follow-up and maintain goodglycemic control throughout pregnancy. Cesarean section may be allowed more liberally, especially with clinical evidence of macrosomic baby, to avoid birth injury and asphyxia. All deliveries of diabetic mother should be attended by pediatrician to minimize complications.

Based on this aim is to study the relationship between Amniotic fluid volume, maternal glucose levels and neonatal birth weight in pregnancy complicated by GDM, Impaired glucose tolerance and normal pregnant mothers and perinatal outcome. Also to select and categorize the patients into cohorts of mothers with pregnancy complicated with gestational diabetes mellitus, gestational impaired glucose tolerance, and normal pregnant mothers, by taking history, examination and investigations and follow up the patients and study their amniotic fluid volume at 36weeks and the birth weight of the neonates. Finally to study the perinatal outcome of the neonates ofnormal, GDM, IGT mothers.

MATERIALS AND METHODS

This study was done as a prospective Cohort study for period of eighteen months, about 200 pregnant women attending Antenatal clinic in Tirunelveli medical college & hospital from around Tirunelveli district in period of 18 months was studied. Pregnant women with singleton gestation, and gestational age of >20weeks, who found to have gestational diabetes mellitus, gestational impaired glucose tolerance and age ≥ 18 years were included in the study.

Pregnant women with history of pregestational diabetes (type 1 or type 2 DM), GDM in previous pregnancies, history of other medical diseases, with multiple gestation, infants known to have fetal anomalies, with history of ischemic heart disease, stroke, Peripheral vascular disease, gestational age of <20weeks, with dyslipidaemia, hypertension, or thyroid disorder were excluded from the study.

Mothers were enrolled in the study after getting informed written consent, They will be studied for Socioeconomic status, Present, Past history, Present and Past Obstetric history, Clinical Examination, Maternal Glucose levels, Amniotic fluid volume(AFI), Delivery and Neonatal Outcome, Perinatal Complications, Neonatal Morbidity.

They were divided into three groups, Gestational diabetes mellitus, gestational impaired glucose tolerance, and normal pregnancy according to the result of glucose tolerance test (GTT), All women will have GTT at 24-28weeks, when they have positive GTT, they will be required to have Amniotic fluid volume at 36 weeks, maternal fasting blood glucose levels, and they will be followed till to delivery and neonatal birth weight will be correlated to study the relationship between these indices. Statistical analysis of linear regression will be done on these indices, Also delivery and perinatal outcome in terms of neonatal morbidities are also studied.

RESULTS

In our study of 200 patients 109 had normal pregnancy, 67 had GDM amd rest 24 had impaired glucose tolerance, the mean age in normal cohort is 26.4yrs, in GDM cohort is 28.49 yrs, while that in Impaired glucose tolerant cohort is 27.67yrs.

Further we analyzed the mean neonatal birth weight in each group, with mean neonatal birth weight in normal group is 2.73kgs, while in GDM group is 2.96kgs, while the birth weight of the neonates born to impaired glucose tolerant mothers is 3.13kgs, denoting neonatal birth weight in Impaired glucose tolerant mothers are slightly higher than NBW of GDM cohort while that is greater than normal group.

Coming to the amniotic fluid volume (mean) in the study groups, with AFI of the GDM group is greater (16.5cms) than the impaired glucose tolerant mothers(13.2cms) which is greater than the normal group(11.3cms)

We next analysed fasting blood glucose values of the cases as a part of GTT and thereby classifying them as three groups, with average FBG in our normal study group is 82mg/dl, while the mean FBG of the patients in GDM group is 182mg/dl, while FBG of the mothers falling in the Impaired glucose tolerant cohort is 109mg/dl.

We evaluated the amniotic fluid volume with all three groups using pearson correlation and linear regression

which showed positive correlation in GDM group.

Table 1: Pearson Correlation Of Amniotic Fluid Volume.

GROUP	Pearson Correlation	P value
Control	0.077	0.425
GDM	0.43	<0.0001
Impaired GT	0.202	0.343

Next we moved on studying the perinatal complication in all three groups as given in the table below, where problems like heart disease, hyper and hypoglycemia, respiratory distress were more in GDM group.

Table 2: Perinatal complications and distribution among the three study groups.

PERINATAL OUTCOME	Control	GDM	Impaired GT
HEART DISEASES	4	6	2
HYPERBILIRUNEMIA	14	5	3
HYPERGLYCEMIA	1	4	1
HYPOGLYCEMIA	0	9	4
LBW	20	0	0
MECONIUM ASPIRATION SYNDROME	2	0	0
RESPIRATORY DISTRESS	14	20	6
POLYCYTHEMIA	1	5	3
ALIVE AND HEALTHY	62	23	8

Individual analysis showed heart diseases presence among the newborn of normal, IGT & GDM mothers, with GDM mothers having higher incidence of heart disease (50%). Hyperbilirubinnemia was seen more in the newborns of threestudy groups.

Hyper and hypoglycemia was seen more in GDM group followed by IGT group which was also statistically significant. Low birth weight babies and MAS were seen more in normal pregnancy while respiratory distress was seen more in GDM and IGT group.

DISCUSSION

In my study, the total number of patients are 200, of which depending upon the Fasting GTT values they were divided into three groups, as 109 pregnant women fall in the normal cohort, 67 women in the GDM cohort, and 24 women fall in the IGT cohort.

In my study, the mean age of the mothers of GDM group is 28yrs, and that of Impaired glucose tolerant mothers is 27 years, which denotes that the GDM mothers are elderly when comparing with normal cohort.

In my study, the average weight of the newborns (NBW) of the IGT group (3.1kgs), is slightly higher (p value >0.5) than the GDM group (2.9kgs) as similarto the study reports of Zu XM et al, but significantly higher than the normal group(2.7kgs) (p value<0.0001), which is similar to the study of Sacks et al and also by Brankica et al.[4]

The Amniotic fluid volume (AFI), average AFI of GDM group(16.5cms) is significantly higher than the normal mothers(11.3cms) (p value <0.0001), as similar to study of Maganha et al[5] and the mean AFI of the IGT mothers(13.5cms) are significantly higher than the normal cohort(11.3cms)(p value<0.0001) which is comparable to the study results of Rosen et al[6], while the mean AFI of GDM cohort (16.5cms) is significantly higher than that of IGT mothers(13.5cms)(p value <0.0001) as opposed to the study results of Xu XM et al and Kofinas et al.

Thus, our study results shows that as the maternal glucose values increases as that in GDM and IGT mothers, the AFI and NBW also increases, but the NBW of IGT cohort (who are treated by diet plan alone) is greater comparing to GDM cohort (treated with OHA or Insulin), thus it signifies the increased risk of foetal hyperglycaemia and thereby foetal macrosomia in IGT group, when comparing with GDM group.

Perinatal outcome (complications) are more in the GDM and IGT cohorts when comparing to the normal cohort as documented by various studies in the literature, by Sreelakshmi et al[7], another study by Mitancrez et al[8] shows that the uncontrolled and severe GDM associated with increased risk of neonatal complications, also study by Bhat et al[9], shows a similar results, documents that the risk of congenital malformations and perinatal outcome is more in pregnancy with GDM.

In my study, the occurrence of heart disease in neonates of GDM and IGT mothers(8.9% & 8.3% respectively) when comparing to normal cohort (3.65), shows the relative higher incidence of heart disease in mothers with hyperglycemia, which is similar to the study of Avisa Tabib et al[10] and Narchi et al[11], also among the 6 case of heart diseases in neonates of GDM, 5 were diagnosedwith ASD, while 1 was diagnosed with VSD, which is opposed to various studies which shows the common cardiac anomaly associated with GDM is TGA and VSD. In my study, the incidence of hyperbilirubinemia in the neonate of IGT cohort ismore (12.8%) when comparing to GDM

(7.4%) and normal cohort (12.5%) as similar to the study results of Gasim et al.[12]

In my study, the occurrence of hyperglycemia as perinatal complication is studied among three groups and results shows that the percentage of hyperglycemia in GDM group (5.9%), that in IGT(4.15%) and less in normal cohort(0.9%), as similar to the study of Gui J et al[13], While the hypoglycaemia in newborns of IGT cohort (16.6%) and is found to be significantly higher, the percentage in GDM cohort(13.6%), while no cases were documented with hypoglycaemia in normal cohort (0%), as comparable to the study of Ma Y, Zhu et al.[14]

Respiratory distress occurs more in newborns of GDM (29.8%) and in IGT (25%),while it occurrence in normal cohort is only 12.85%, which is comparable to the study of Gasim T et al and Perrson et al[15] reports the increased risk of neonatal complications associated with pregnancy with GDM.

CONCLUSION

Pregnancy complicated with Diabetes mellitus carries significant risks for both mothers and infants, since outcome of such pregnancy remains substantially worse than that of general gestational population. The adverse maternal and neonatal outcome highly related to poor glycaemic control and hence confirmed on the importance of Antenatal care and effective treatment in Antenatal period.

GDM, uncontrolled hyperglycaemia will increases the risk of preeclampsia, ceaserean delivery, future type 2 diabetes, in the mothers while In fetus or neonates, it is associated with higher rates of perinatal morbidity, macrosomia, respiratory distress, neonatal hypoglycaemia. Various studies confirmed on the importance of treatment and perinatal care of diabetic mother to ensure optimal control of their blood glucose levels in order to lower severe perinatal outcomes among infants.

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