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STUDY OF MATERNAL TRIGLYCERIDES AND FETAL WEIGHT IN NON-DIABETIC PREGNANT WOMEN.

Obstetrics & Gynaecology

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ABSTRACT

Background: To study the relation of mid pregnancy maternal fasting triglyceride levels with birth weight, independent of maternal glucose levels and obesity. **Methods:** A hospital based longitudinal study was conducted. All non-diabetic and having singleton antenatal women, attending the department of Obstetrics and Gynaecology were included in study. **Results:** The mean age of the participants was 26.8 (2.1)years with a minimum of 21 years and a maximum of 30 years. The median age of the participants was 27 (25-29) years. The mean birth weight was 3044.1 (511.4) grams and 5.2% of new-borns were large for gestational age. Total cholesterol was 246.1 (29.4) mg/dl with a minimum of 167.0 mg/dl and a maximum of 332.0 mg/dl. Similarly, the mean triglycerides was 192.9 (19.8) mg/dl with a minimum of 159.0 mg/dl and a maximum of 286.0 mg/dl. **Conclusion:** There was a positive significant association for Gestational age at delivery, pre-pregnancy maternal BMI, weight gain during pregnancy, and serum triglycerides.

KEYWORDS

lipid profile, birth weight, fetal outcome.

INTRODUCTION

Developmental origins of health and disease (DOHaD) theory, maternal lipid levels may lead to adverse birth outcomes such as LGA due to adverse growth pattern. Fetal growth is determined largely by maternal factors, including not only plasma glucose levels but also other fuels, such as lipids and amino acids,[1] especially in non diabetic women. Increased lipid levels contribute towards hormonal and nutritional support of a healthy pregnancy;[2] During pregnancy, maternal insulin resistance leads to decreased lipoprotein lipase (LPL) activity andhence 2–3-fold increased maternal triglyceride levels.[3] Maternal triglycerides in the form of both liver-derived very low-density lipoprotein (VLDL) and dietary chylomicrons must first be hydrolysed to free fatty acids (FFA) by placental lipases to allow uptake by the syncytiotrophoblast.[3,4] There FFA can be stored, metabolized, oxidized or transported into the fetal circulation.[5] Several studies have demonstrated that in non-diabetic pregnancies, birth weight and the risk of macrosomia or large for gestational age (LGA) were positively associated with maternal serum triglyceride (TG) levels.

MATERIALAND METHODS

A hospital based longitudinal study was conducted in the Department of Obstetrics and Gynaecology, Pravara rural hospital, Pravara Institute of Medical Sciences in Loni, Maharashtra. Study was conducted for 2 years. All non diabetic and having singleton antenatal women of 24-32 weeks of gestation, attending the department of Obstetrics and Gynaecology were included in study. Thus, such total of 154 non-diabetic pregnant women were studied. Data was analysed using SPSS V21 for IBM for windows. Continuous variables like age, weight, gestational age, plasma glucose and serum triglyceride levels were presented as mean standard deviation. Categorical variables like mode of delivery, BMI of mother and neonatal birth weight were presented as frequency and percentages. Pearson correlation was used to evaluate the association between each lipid concentration and other predictor variables and new-born weight at term. Multivariable linear regression analysis was used to predict that the maternal hyperlipidaemia in mid- pregnancy as a risk factor for LGA, adjusting for confounders. A p value of <0.05 was considered statistically significant.

RESULTS

During the study period, a total of 154 non diabetic women were enrolled. The mean age of the participants was 26.8 (2.1) years with a minimum of 21 years and a maximum of 30 years. The median age of the participants was 27 (25-29) years. More than half (55.2%) of the participants were primigravida. The mean pre-pregnant BMI was 22.6 (2.9) kg/m^2 and the mean weight gain during pregnancy was 9.9 (1.4) kgs with a minimum gain of 8.0 kgs and a maximum gain of 14.2 kgs. The mean gestational age at the time of screening was 28.1 (1.7) weeks with a minimum of 24 weeks and a maximum of 32 weeks. **Table 1** shows that the mean birth weight was 3044.1 (511.4) grams and 5.2% of newborns were large for gestational age. **Table 2** shows that the mean total cholesterol was 246.1 (29.4) mg/dl with a minimum of 167.0 mg/dl and a maximum of 332.0 mg/dl. Similarly, the mean triglycerides was 192.9 (19.8) mg/dl with a minimum of 159.0 mg/dl and a maximum of 286.0 mg/dl. **Table 3** shows that there was no correlation between maternal total cholesterol and birth weight (r=0.084; p=0.72). **Table 4** shows that there was a strong positive correlation between maternal serum triglycerides and birth weight and it was found to be statistically significant (r=0.650; p =0.001).

DISCUSSION

Present study showed that serum triglycerides were found to be positive independent predictors of birth weight after adjusting for gestational age at delivery, pre-pregnancy maternal BMI, weight gain during pregnancy, maternal total cholesterol, serum triglycerides and fasting blood glucose. Similar results were reported by various other studies across the globe.[6,7,8,9,10,11] A study of Vrijkotte et al[12] found that the highest triglyceridequintile was associated with a higher birthweight and a higher prevalence of a child born LGA. The limitation of that study was that they did not take the influence of glucose into account, even though it is a well-known confounder for triglyceride levels. Our study accounted for the fasting glucose levels and it was adjusted in the regression and hence it added more credibility to our study. The study by Knoppetal[13] found that triglyceride level after a 50-g oral glucose load at 24–28weeks' gestation was significantly associated with adjusted newborn weight, independent of maternal obesity. It is noteworthy to mention that the correlation coefficient was strong in our study (r=0.650) when compared to the other studies. Another important finding in our study is that the total cholesterol was not significantly associated with the fetal macrosomia, which is in line with other studies.[14,10,15,16]

A study by Kushtagi et al[7] showed a positive association for triglycerides and Maternal BMI. But there was no association between the glucose levels and the total cholesterol with the birth weight of the baby. This is totally in line with our study where our study also showed a significant association for the triglycerides but not for the total cholesterol. Although significant associations between maternal TG or HDL-C levels and newborn weight were demonstrated, the mechanisms have not yet been fully elucidated. Maternal serum TG does not directly cross the placenta, but the presence of lipoprotein receptors, various fatty acid-binding proteins, and lipase activity in the placenta enables the release of free fatty acids (FFAs) from TG and their efficient transport to the fetus. It is speculated that the increased hydrolysis of maternal TG by placental lipoprotein lipase to FFAs and

the excessive delivery of fatty acids to the fetus may be partly responsible for the increased risk of macrosomia among women with hypertriglyceridemia. Despite the possible mechanisms mentioned above, these do not fully explain the associations between TG and macrosomia.

Table 1- Distribution of the newborns by birth weight (N=154)

Birth weight (grams)	Frequency (n)	Percentage
Mean (SD)	3044.1 (511.4)	
Large for gestational age		
Yes	8	5.2
No	146	94.8

Table 2- Serum lipid levels among the study participants (N=154)

	Total cholesterol (mg/dl)	Serum triglycerides (mg/dl)
Mean (SD)	246.1 (29.4)	192.9 (19.8)
Median (IQR)	247.0 (224.0-264.0)	189.0 (178.0-205.0)
Minimum	167.0	159.0
Maximum	332.0	286.0

Table 3- Correlation between maternal total cholesterol and birth weight (N=154)

TC	N	Mean	Std. Deviation	Minimum	Maximum	P value
150-200	8	3020.63	621.161	2430	4249	0.72
200-250	74	3031.89	453.609	2200	4358	
250-300	65	3122.12	617.973	1948	4700	
>300	**7**	**3179.43**	**557.574**	**2566**	**4362**	

Table 4- Correlation between maternal serum triglycerides and birth weight (N=154)

S. Triglycerides	N	Mean	Std. Deviation	Minimum	Maximum	P value
150-200	105	2875.39	454.517	1948	4349	0.001
200-250	46	3443.11	381.951	3125	4700	(S)
250-300	3	4473.33	196.309	4358	4700	

CONCLUSION

On unadjusted analysis, there was a positive significant association for Gestational age at delivery, pre-pregnancy maternal BMI, weight gain during pregnancy, and serum triglycerides. However, on multivariable linear regression analysis, only gestational age at delivery and serum triglycerides were found to be positive independent predictors of birth weight. More such studies with a larger sample size and at a multicenter level are required to confirm our hypothesis which in turn will help in protecting the health of the newborn from fetal macrosomia related complications.

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