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An analysis on Link of Maternal Lipid Profile and Gestational Diabetes Mellitus: A Case Control Study of 120 Women

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ABSTRACT

BACKGROUND: Gestational diabetes mellitus GDM is a clinical condition, or disease, wherein, a marked reduction in the sensitivity of insulin, during pregnancy, is attributed to the metabolic disturbance that occurs widespread. Although, information on the association among dyslipidaemia and GDM remains uncertain till date. The main objective of the present investigation is to detect any correlation between lipid profile of GDM subjects and healthy control women,using biochemical indicators.

METHODS: A careful clinical case study was performed, involving a total of 120 subjects, comprising two distinct groups. Group I includes 60 pregnant women, those were recently detected as GDM cases. Group ll covers healthy control subjects collected from Open Patients unit and Registry of Diabetic Unit of Dhanalakshmi Srinivasan Institute Medical science and Hospital, Perambalur, Tamil Nadu. Both groups' subjects were bifurcated, based on their age groups, and found to be 25 to 45 years. Estimation of glycemic condition, in prior and post fasting was performed, using an analyzer appropriately. Similarly, maternal lipid profile for both groups was also determined. Moreover, HbAl c, an important biochemical indicator was also detected for both groups of subjects with respect to their age, using HPLC technique. Received data were pooled and a statistical analysis was performed, using Student t test to identify the significance difference or association between GDM group and healthy subjects, in specific, on the maternal lipid profile.

FINDING: Analysis showed that there is a significant difference observed in the maternal lipid profile of GDM group, when compared with healthy subjects. The P value of Very Low Lipid protein VLDL, low density lipoprotein LDL, High density lipoprotein HDL was found to be 0.01, 0.028, and 0.038 respectively. Whereas, p value for HbAl c was recorded as 0.02, and found significant difference at 0.01 percent level. Interestingly, no difference was observed in the limit of FG, and Triglycerides limit, and were reported as p _0.28, and p- 0.316 respectively. A marked difference was also detected among the 30 to 35 yrs age group.

INTERPRETATION: Present investigation elucidated that there is a strong correlation between GDM

subjects and dyslipidemia. Further, this study strengthened and promised that elevated maternal lipid profile is highly linked with GDM condition.

KEYWORDS: Lipids profile, metabolic disease, glycemic sensitivity

Introduction

Gestational diabetes mellitus (GDM) is a metabolic syndrome, unveiling insulin resistance, and is a popular medical complication, on track, during pregnancy. (Fatemeh Alsadat Rahnemaei et al.,2022). In the recent past, the incidence of GDM has augmented significantly, and is attributed to idleness, overweightness, and late age pregnancy. One among ten pregnant women was detected with diabetes, of those, 90% mothers found to be GDM cases. It has been reported that 17 % of GDM women were detected in Worldwide (Fatemeh Alsadat Rahnemaei et al.,2022).

Earlier investigations elucidated that pregnant women with GDM are characterized with higher levels of lipidemic, compared to the healthy. The glucose tolerance ability is effective in normal pregnancy, whereas, no consistent interpretation remains, on raised lipid limit of GDM women, however, it has been believed to be, due to its heterogeneity (Jill Layton et al., 2018). Besides, Physiological onset of insulin resistance triggers around 24–28 weeks of gestation and continues throughout pregnancy (Zeynab Farsangi et al.,2020).

However, a study emphasized that an altered maternal lipolytic with uncertain increase in lipids during early pregnancy and a marked rise observed in later stage, particularly, in triglycerides (TGY) and a slighter elevation recorded in phospholipids and cholesterol (Bharathi et al., 2017). Another convincing study demonstrated by Herrera et al., (2018) described that diminished lipid metabolism in normal women with diabetes, is a crucial factor for onset of these complications, medically termed as hyperglycemics.

A crucial study underlined that lesser insulin-sensitivity to the pregnant women shows high risk in delivery, indicating other factors could be responsible for macrosomia and its associated birth hitches (Powe et al.,2016). Many accumulating studies reveal that GDM is likely to be closely linked with alteration in the lipid profile limit, which leads to adverse effects to the pregnant women.

Moreover, investigations around various sections of the world have affirmed that changes in lipid level while pregnant, may play a vital role in the onset of GDM (Bharathi et al., 2017). The connection with metabolic changes in lipid and GDM pregnant women is found unclear. Hence, the present investigation is performed with a chief objective to examine changes in the metabolic pathway of lipid profile in GDM women and compared with healthy pregnant women, as a case control study.

Materials and Methods

Selection of Participants

A case-control study was focused in the department of Diabetes and also from the registry of Gynecology and Obstetrics unit in Dhanalakshmi Srinivasan college of Medical Sciences and Hospital, Perambalur District, Tamil nadu, India, during 2018. The inclusion criteria was followed for women with onset of pregnancy, in specific age with 25 to 32 weeks of gestation. Whereas, the history of diabetes mellitus, acute dyslipidemia, and chronic diseases were considered as exclusion criteria for the selection of participants. Based on the typical formula for sample size design for comparing means difference between two independent variables, considering statistical error of 5% ($\alpha = 0.05$) and 1 % , and standard deviation in GDM cases and healthy subjects, as reported in earlier investigation. To this study, a total of 120

subjects were planned and grouped as Group A and Group B. 'A' group includes 60 numbers recently identified as onset of GDM cases with different age groups. 'B' group covers healthy subjects of similar numbers, collected from the registry of Gynecology units. Both groups were screened according to their age (25-45 yrs), and excluded earlier treatment or routine lifestyle variation for preceding to medical appointment.

Study pattern

After getting consent, in writing, from both group subjects, a total of 120 women with gestation were assessed. Among them, 60 subjects were diagnosed with GDM earlier, using a glucose tolerance test (GTT) and other healthy 60 healthy subjects were categorized as a control group. A standard GTT test was performed with fasting plasma, subsequently 1 h and 2 h duration and lipid profile examinations were also carried out for both groups. To quantify the lipid profile, after 12 hours of fasting with subsequent 5 min. relaxation, 8-mL blood sample was collected from Group A subjects and healthy pregnant women, using appropriate syringe containing anticoagulant. The collected blood samples then, kept under centrifugation to detect the lipid parameter such as, level of cholesterol, TG, LDL, and HDL, using Auto Analyzer. The Standard ranges for cholesterol, LDL, HDL, and TG were referred to with National Cholesterol Education Program Adult Treatment Panel III rules (Bethesda, 2001).

To measure the glycemic condition in blood samples, prior and post fasting samples were taken from both group subjects at 1h, and 2h duration. Plasma glycemic level was determined after fine plasma centrifugation, by employing glucose-oxidase technique, by using a kit. Obtained data were recorded for further analysis. HbAl c is an important biochemical indicator that also was detected using HPLC technique on both group subjects.

Apart from these, important demographic profile were also collected from all subjects, by means of a checklist entailing of age, prenatal period, uniformity, gestational period , traditional history of dyslipidemia, body mass index (BMI) in prior pregnancy, blood pressure, variation in weight gain while trimesters, high blood pressure details in earlier gestations were noted as suggested in previous studies (Zeynab Farsangi., 2020).

Statistical analysis

Obtained data were examined and analysis was made using Statistical Package for the Social Sciences (SPSS) software, version 24 (SPSS Inc.). The descriptive statistics covering mean, standard deviation, frequency, and percentages were computed and presented to interpret. Independent t-test was used to compare variability between the two independent variables. P-value < 0.05 was fixed as a significant difference.

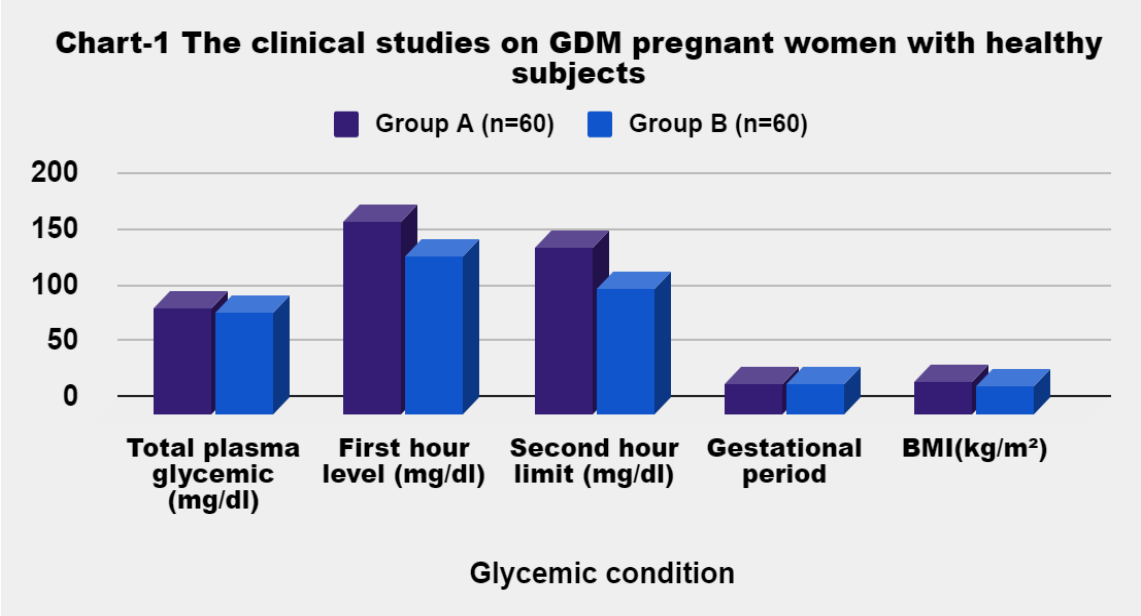
Results

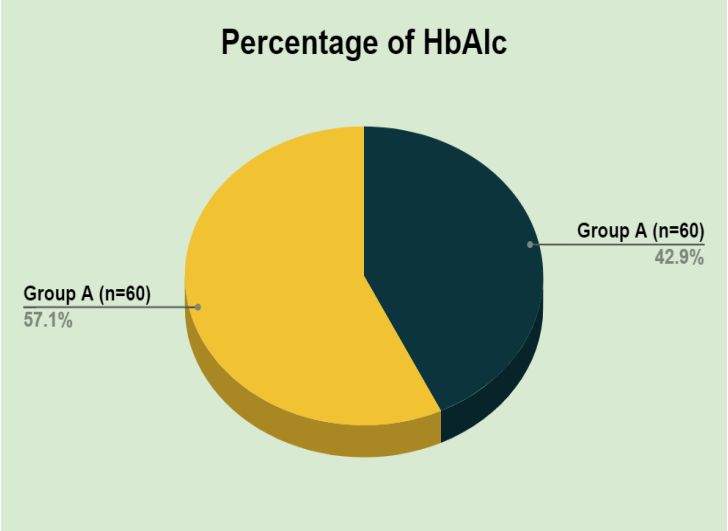
In the present investigation, a critical analysis has been carried out with 120 pregnant women at 27 to 32 weeks of gestation. They were divided into 60 pregnant women detected with GDM (Group- A), and the rest of 60 were healthy pregnant subjects (Group-B). Tables 1 and 2 demonstrated the clinical features and biochemical variables of the examined members. The average range of age of the Group-A, and Group-B participants were found to be 28.57 ± 0.6 and 30.04 ± 0.32 years respectively. Results displayed that gestational period, plasma glycemic level in fasting, and also during 1h- and 2h-, and body mass index were shown to be significantly increased in Group A at P value <0.05, when compared to Group- B. Supplementary restrained variables were found to be an insignificant difference between both A and B

groups. The HbA1c (p = 0.018) limit was found to be a significant difference in Group- A participants, when compared with normal.

Table 1- An analysis on the clinical features among GDM pregnant women with healthy subjects

S.no	Measured indicator	Group A (n=60)	Group B (n=60)	'*p*-Value' * ≤ 0.05
Glycemic condition				
1.	Total plasma glycemic (mg/dl)	**93.7**	**91.02**	**0.012***
a	First hour level (mg/dl)	**172.64**	**140.38**	**<0.001**
b.	Second hour limit (mg/dl)	**148.36**	**112.61**	**<0.001**
2	Gestational period	**27±1.22**	**26±4**	**0.04***
3	BMI(kg/m²)	**28.12**	**24.39**	**0.389***
4.	**Percentage of HbAIc**	**5.28**	**7.02**	**0.043 ***
***Denotes significant difference**				



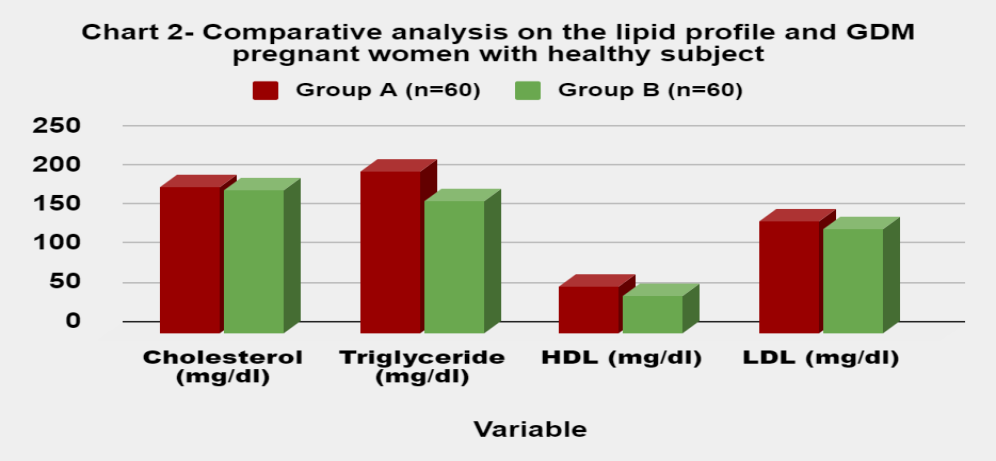


While we compared the lipid profiles for both groups, the outcome showed that there was a significant elevation in HDL levels in the Group-A, compared to the healthy group (Group- B) with P value of 0.04. Whereas, TGY levels were also found to be raised in the Group-A women. However, When we compare both groups, the outcome is shown to be a significant difference statistically. Moreover, Total cholesterol level was also accelerated in Group - A , and the differences were statistically significant in the level of TGY (P value = 0.038), and Total cholesterol (P value=0.04) respectively. On the other hand, other variables such as LDL limit and it were observed as higher in the participants of group-A. However, the LDL-c level was found to be statistical insignificance (P = 0.82) and a little drop was observed in Group B women. (Table 2).

Table 2- Comparative analysis on the lipid variable among GDM pregnant women with healthy subjects

S.no	Variable	Group A (n=60)	Group B (n=60)	'*p*-Value' * Significance
1.	Cholesterol (mg/dl)	187.9	184.3	0.04*
2	Triglyceride (mg/dl)	208.6	168.93	0.038*
3	HDL (mg/dl)	59.9	47.8	0.029*
4	LDL (mg/dl)	143	133.3	0.82

Values are expressed as mean value and variable analysis performed for cholesterol and Triglyceride by student 't' test '*p*-Value' * ≤ 0.05 is considered significant.

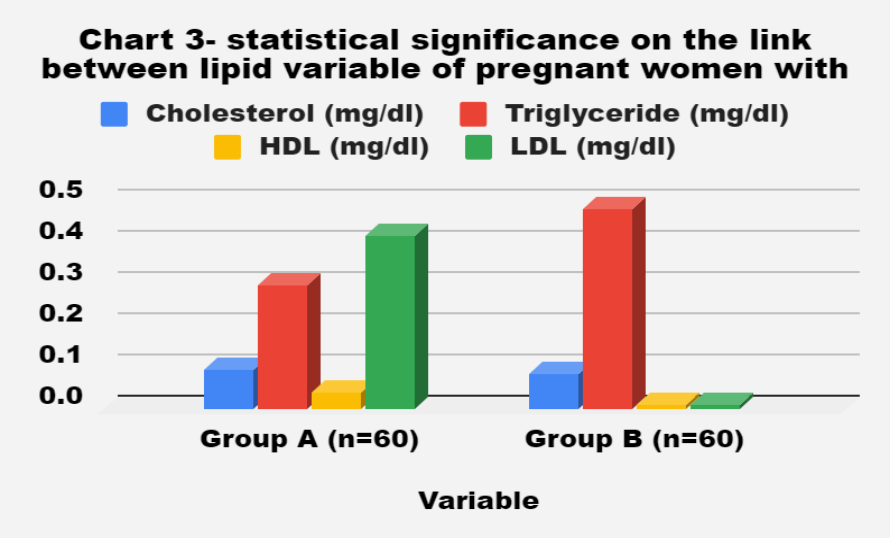


Study established a remarkable link between HDL frequency and GDM disease (P = 0.08). This connotation or link persisted pointedly while tuned, pertinent to the age, BMI, and gestational period (P = 0.009). No significant link was exhibited between GDM and TG, cholesterol, and LDL levels (P > 0.05) (Table-3).

Table 3- Analysis on the link between lipid variable of pregnant women with GDM

S.no	Variable	Group A (n=60)	Group B (n=60)	'*p*-Value' * Significance
1.	Cholesterol (mg/dl)	0.092	0.086	sig
2	Triglyceride (mg/dl)	0.298	0.481	
3	HDL-c (mg/dl)	0.039	0.008	
4	LDL-c (mg/dl)	0.417	0.007	

Values are expressed as mean value and variable analysis performed for cholesterol and Triglyceride by student 't' test '*p*-Value' * ≤ 0.05 is considered significant.



Discussion

Recently, several studies described that lipid components and hyperglycemic conditions are crucial and considered to be prognosticators for detecting error in metabolic activities covering blood pressure, dyslipidemia, and other heart related disorders. The irregularities occurring in Carbohydrate metabolism detected in GDM would connect and affect other important physiological metabolism pathways including lipids (Lenin.,et al. 2017).

The primary objective of the present investigation was to compare and to detect the changes in the lipid profile of GDM pregnant women and healthy control. Examined variables of the lipid components, such as TGLY, Total cholesterol, HDL-c and LDL-c were recorded and shown to be raised up in Group-A subjects. Though, the LDL limit displays statistically insignificant differences between Group-A, and B. Whereas, HDL-c exhibited a remarkable significant difference and perceptible association was detected with Group-A subjects. It is interesting to note that HDL-c fraction found in Group-A participants display the correlation or matching, even after making alterations for age, BMI, and gestational period. In contrast, there was no significant combination between GDM and TGLY, LDL, and cholesterol fractions for both groups statistically.

In many investigations, it has been elucidated that pregnant women with Gestational diabetes mellitus are mostly found at a remarkably improved risk of developing metabolic impairment, after gestation, covering hyperlipidaemia. However, other recent findings argued that GDM women are susceptible to increased TGY , LDL-c and total cholesterol level and showed lesser levels of HDL-c, and such results are still unclear and unpredictable (Bharathi et al.,2017). In our study, there was a statistically significant elevation in HDL-c , total cholesterol, TGLY, and LDL-c level with P value of less than 0.05), observed in the Group-A, compared to the Group – B. However, it was appeared to be statistical insignificance recorded in LDL-c level. It has been presumed that as described by kalpana et al changes in lipid fractions increased during gestation, observed in our study , might have been attributed to the accelerated oxidation of free fatty acids, resulting, elevated concentrations of acetyl CoA that improves and drive effectively on the lipid profile, which is present in the liver. Acetyl coA is a key regulator of the production of total cholesterol, Triglycerides and fatty acids. Our investigation also favors statistically insignificant differences in LDL-c limit recorded in Group-A participants. These findings are interestingly correlated with the studies of Lenin et al., (2017).

In contrast**,** another reliable study demonstrated by Koukkou et al. who observed the total cholesterol concentration was shown to be insignificantly different between GDM groups and healthy subjects , while lower LDL concentration was reported (Koukkou et al., 1996). However, many previous investigations reported that an elevated limit of Total cholesterol was detected in GDM women, when compared with healthy subjects, these outcomes strengthened our findings (Asif et al. (2018), McGrowder et al. (2009), and Khan et al. (2013). Besides, Layton et al., (2018) have underlined that GDM pregnant women with less glycemic sensitivity showed increased levels of TGLY with least HDL-c when compared with healthy subjects, that may be, due to the incidence of physiologic heterogeneity. Similarly, In many studies, we found that HbA1c level observed was statistically significant with GDM groups while compared with control. Our investigation also co- incided with the findings of Lenin.,et al. (2017), and we reported statistically significant differences. In accordance with Capula et al. who described, HbA1c marker is a virtuous interpreter for detecting antagonistic gestation consequences (Ghazanfari, et al.,2010). Our aim was to determine the changes in lipid fractions, and the sample size

of the examined was very limited. Moreover, interpretation of insulin sensitive markers are essential to reach consistent results.

Future prospects and conclusion;

This present investigation was endorsed that there is a promising link between lipid fraction of pregnant women and GDM onset. Our findings will help as a reference for further investigation to investigate the role of link in lipid profile and its impact on fetal development in GDM pregnant women.

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