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A STUDY ON SERUM LIPID PROFILE IN SECOND TRIMESTER OF PREGNANCY AS A PREDICTOR OF PREECLAMPSIA

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ABSTRACT

Objective: To establish serum lipid profile in second trimester of pregnancy as a predictor for preeclampsia which will help in predicting the disease and preventing the complications before it manifests. **Method:** This was an observational prospective cohort study conducted at Gauhati Medical College and Hospital, Assam for a duration of 1 year from April 2020 to March 2021. 500 primigravida with singleton pregnancies of gestational age 20-28 weeks were enrolled who met the inclusion and exclusion criteria. Serum lipid profile was done in second trimester and the patients were followed up till their confinement. **Results:** The incidence of Preeclampsia was 10.8% in our study. The mean serum total cholesterol levels 249.78 ± 19.78 mg/dl, the mean Sr Triglyceride levels 217.28 ± 55.42 mg/dl, mean Sr LDL levels 151.57 ± 21.96 mg/dl and mean Sr VLDL levels 69 ±15.44 mg/dl were high in patients whereas mean Sr HDL levels 28.52 ± 10 mg/dl were lower in patients who developed preeclampsia. 50% patients with BMI in overweight category (25-29.9) developed preeclampsia compared to 42% patients in normal weight category. **Conclusion:** Our study concludes that there is a positive correlation between deranged lipid profile in second trimester and increased BMI with development of preeclampsia in third trimester which could be used as a predictor of preeclampsia.

KEYWORDS : Preeclampsia, Serum Lipid Profile, Body Mass Index (BMI).

INTRODUCTION

Preeclampsia is one of the leading complications of pregnancy which contributes to high maternal and foetal morbidity with incidence of 2-8% worldwide[1]. It has affected with worsening rate of >500,000 foetal and neonatal deaths and >70,000 maternal deaths worldwide[2].

Despite continuous efforts and research the exact aetiology remains unknown. Many markers and predictors have been studied recently which help in predicting preeclampsia. Still many other factors are under study as the pathology might be multifactorial.

Preeclampsia is defined as multiorgan disease of unknown origin with new onset hypertension seen after 20 weeks of pregnancy with systolic hypertension >= 140 mmHg and diastolic hypertension >= 90 mmHg with proteinuria or without proteinuria but with features of end organ damage such as thrombocytopenia, impaired liver function test, impaired renal function test, pulmonary oedema, blurring of vision or blindness.

The hypothesis suggested behind preeclampsia are the two staged hypothesis of incomplete trophoblastic invasion of spiral arterioles, genetic predisposition, placental ischemia, immune maladaptation and oxidative stress and VLDL toxicity. The relationship between altered serum lipid profile and preeclampsia lies in relation with oxidative stress and placental injury, which leads to excessive release of thromboxane and decreased synthesis of prostacyclin causing vasoconstriction, also there is imbalance between angiogenic and antiangiogenic factors that leads to endothelial injury, causing the main pathology.

MATERIALS AND METHODS

It was a prospective observational study conducted at Gauhati Medical College and Hospital, Assam from April 2020 to March 2021. 500 patients were enrolled according to inclusion and exclusion criteria among which 54 patients developed preeclampsia, 366 patients did not develop preeclampsia and 80 patients were lost to follow up.

Inclusion Criteria- Antenatal patients with gestational age from 20 -28 weeks primigravida with singleton pregnancies.

Exclusion Criteria- Antenatal patients with complications like chronic hypertension, diabetes mellitus, hepatic disease, multiple pregnancy, epilepsy disorder, renal diseases.

A detailed questionnaire was filled including all the sociodemographic details of the patients including age, pre-pregnancy BMI, gestational age and the relevant history.

Blood test were done including serum fasting lipid profile in second trimester which included Total cholesterol, Triglycerides, HDL, LDL, VLDL levels and the patients were followed up till their confinement and were evaluated on the basis whether they have developed preeclampsia or not.

Statistical Analysis:

Chi square test was used to evaluate association between categorical variables. Mean and standard deviation were used as statistical tests. Independent T test was used to compare mean difference between two groups. All data were analysed using SPSS version 21.A p value less than 0.05 is considered as statistically significant at 95% level of significance.

RESULTS AND OBSERVATIONS

Results were obtained by calculating whether patient developed preeclampsia or not which was distributed according to patient's variables such as pre pregnancy BMI, age and the various components of serum lipid profile to see which component contributed significantly.

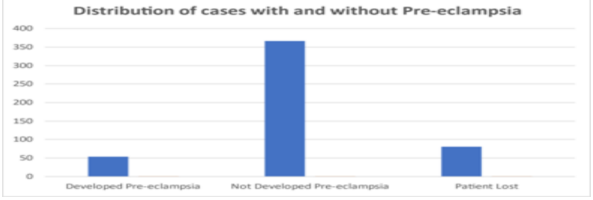

Figure1. A Bar diagram representing number of patients with and without Preeclampsia (Study population= 500)

The diagram shows that out of the total study population of 500 subjects, 54 patients (10.8%) developed preeclampsia, whereas 366 patients (73.2%) did not develop preeclampsia, also 80 patients (16%) were lost to follow up. Hence incidence of Preeclampsia is calculated to be 10.8% in our study.

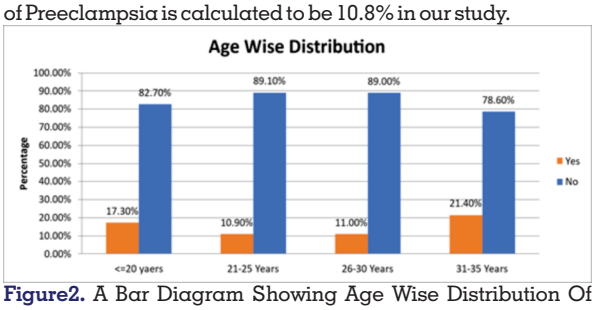

Figure2. A Bar Diagram Showing Age Wise Distribution Of Patients Who Developed Preeclampsia.

This Bar diagram shows relationship of age with development of preeclampsia, between 21-25 years of age, 10.9% patients were seen who developed Pre-eclampsia, whereas highest percentage 21.4% was seen in age group of 31-35 years. Statistical analysis was performed, a P value of 0.05 was considered statistically significant. There was no significant difference seen in the incidence of preeclampsia with respect to age group as P value is 0.2.

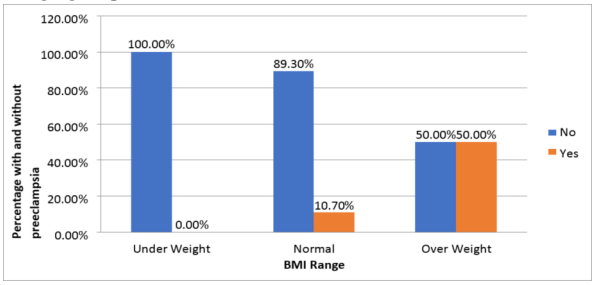

Figure3: A Bar Diagram Representing Incidence Of Preeclampsia In Relation With BMI (Body Mass Index)

This bar diagram shows that 50 % patients developed Preeclampsia who were overweight with BMI of 25-29.9 kg/m^2, only 10.7% developed pre-eclampsia who were in normal weight range with BMI of 18.5-24.9 kg/m^2. Statistical analysis was performed. A P value of <0.05 was considered statistically significant. There was significant difference seen in incidence of pre-eclampsia with respect to BMI (P<0.001) suggestive of a positive correlation between BMI and pathogenesis of preeclampsia.

Table1. Relationship Of Preeclampsia With Mean Values Of Total Cholesterol.

Preeclampsia	Number	Mean T. Cholesterol(mg/dl)	S.D.
NO	366	159.55	19.689
YES	54	249.78	19.782
TOTAL	420	171.15	36.077

P value <0.001

This table shows the mean values of Total Cholesterol in patients with and without Preeclampsia. Mean total cholesterol was high 249.78mg/dl, (normal = 200mg/dl) in patients who developed Preeclampsia. A P value of <0.05 was considered significant. The difference was found statistically significant (P <0.001).

Table2. Relationship Of Preeclampsia With Mean High Density Lipoproteins

Preeclampsia	Number	Mean HDL (mg/dL)	S.D.
NO	366	31.26	8.57
YES	54	28.52	10.003
TOTAL	420	30.91	8.802

P value <0.001

The above table shows the mean values of HDL Cholesterol in patients with and without Preeclampsia. The Mean HDL values were lower in patients who developed Pre-eclampsia values being 28.52 mg/dL with standard deviation of 10.003. A P value of <0.05 was considered significant. And there was a significant difference seen between mean HDL value and occurrence of preeclampsia (p value < 0.001).

Table3. Relationship Of Preeclampsia With Mean Values Of Low Density Lipoproteins

Preeclampsia	Number	Mean LDL (mg/dl)	S.D.
NO	366	81.66	17.963
YES	54	151.57	21.961
TOTAL	420	90.65	29.851

P value <0.001

Table 3 shows that Mean values of Low Density Lipoprotein Cholesterol are increased in patients who developed Pre-eclampsia with a value of 151mg/dl (Normal< 130 mg/dl) with Standard Deviation of 21.9. A P value of <0.05 was considered significant. There was a significant difference seen in our study (P <0.001).

Table4. Relationship Of Preeclampsia With Mean Values Of Very Low Density Lipoproteins

Preeclampsia	Number	Mean VLDL (mg/dl)	S.D.
NO	366	46.58	16.584
YES	54	69	15.442
TOTAL	420	49.47	18.061

P value <0.001

Above table shows that mean value of Very Low Density Cholesterol (VLDL) is high 69 mg/dl (normal value being <50 mg/dl) in patients who developed Pre-eclampsia with Standard Deviation of 15.4. A P value of <0.05 was considered significant. There was a significant difference seen in our study (P <0.001).

Table5. Relationship Between Preeclampsia With Mean Triglycerides

Preeclampsia	Number	Mean Triglycerides	S.D.
NO	366	158.49	36.727
YES	54	217.28	55.427
TOTAL	420	166.05	44.178

P value <0.001

Table 5 shows that mean triglycerides Values were higher in patients who developed Pre-eclampsia =217 mg/dl (normal <150mg/dl) with standard deviation of 55.4. P value of <0.05 was considered significant. There was a significant difference seen in our study (P <0.001).

DISCUSSION

This study conducted in Gauhati Medical college and hospital over 1 year was an attempt to contribute in establishing one of the probable risk factors in causation of Preeclampsia which if significant could be known well in advance before the drastic symptoms sets in third trimester of pregnancy affecting the morbidity and mortality significantly in mother and foetus.

In our study, conducted over 500 pregnant patients attending GMCH antenatal OPD and following up them till their confinement, the incidence was found to be 10.8% (54 / 500 patients). The global prevalence of preeclampsia is 2-8 %.[1]

Incidence of Preeclampsia in India is 8-10% according to National Health Programs Indian government statistics. This high incidence in India might be due to high population density, early marriage and childbearing in our country, especially in rural sector and also the prevalence of obesity in India.

In our study we found significant relation between development of Pre-eclampsia and raised BMI suggestive of a significant role of obesity in pathology of Pre-eclampsia. In our study 12 patients (50 %) patients developed Preeclampsia who were overweight compared to only 10.7% who were in normal weight range. The study was found similar to study of O'Brien et al conducted in 2003[3] who suggested that increased maternal BMI increases the risk of preeclampsia.

In our study mean serum total cholesterol levels were seen high in patients who developed Preeclampsia. This study was found similar to studies done by Kharb S et al in 1998[4], Hubel et al in 1998[5], Ware Jauregui et al in 1999[6], Gokhan Bayhan in 2005[7], Shreya Yadav et al in 2018[8],Blessy Prabhu Priyanka S in 2019[9].

In our study there was significant increase seen in mean serum triglycerides levels in patients who developed Preeclampsia. Although raised serum triglycerides were also seen in normal pregnant patients but significant rise was seen in preeclampsia patients. Similar findings were seen in studies of Sattar et al in 1997[10], Kharb S et al in 1998[4], Hubel et al in 1998[5], Ware Jauregui et al in year 1999[6], T Clausen, S Djurovic and T Henriksen in 2001[11], Ramsay et al in 2002[12],by V.M. Vinodhini, V. Devisri, W. Ebenezer William in 2012[13], Elisa Llurba, Eduard Gratacos et al in 2005[14].

In our study mean serum LDL levels were found to be raised in patients who developed preeclampsia. These findings were seen similar to studies of Hubel et al in 1998[5], Gokhan Bayhan in 2005[7], Shreya Yadav in 2018[8], Blessy Prabhu Priyanka S in 2019[9].Raised serum LDL values in preeclampsia suggest that oxidative stress might be a contributor in pathophysiology of Preeclampsia.

In our study the mean value of very low density lipoprotein was found to be raised in women who developed preeclampsia. Similar findings were seen in studies done by Ramsay et al in 2002[12], Basak Baksu, Alparslan Baksu in 2005[15], Shreya Yadav in 2018[8], Blessy Prabhu Priyanka S in 2019[9].

In our study the mean values of serum High Density Lipoprotein were seen low in patients who developed preeclampsia. These findings were consistent with findings of Ware Jauregui et al in year 1999[6], Ramsay et al in 2002[12], Gokhan Bayhan in 2005[7], Shreya Yadav et al in 2018[8], Blessy Prabhu Priyanka S in 2019[9].

There were loss of 80 patients to follow up in the study which was mostly seen during the Sars Covid 19 virus pandemic peak time probably due to lack of commute and the strict guidelines by the government affecting the patients who stayed remotely from the city.

CONCLUSION

In our study the incidence of preeclampsia is high which is 10.8%. A significant relationship is seen between raised serum cholesterol levels in second trimester and development of preeclampsia. LDL, VLDL and triglycerides were seen elevated in patients who developed preeclampsia. HDL values were low in patients who developed preeclampsia. Patients with obesity had higher incidence of preeclampsia. Age was not a significant factor in development of preeclampsia.

Hyperestrogenism is seen in pregnancy that leads to increase in synthesis of lipids. The increased levels of various lipid profile parameters in preeclampsia patients leads to deposition of triglycerides in predisposed vessels such as uterine vessels and leads to endothelial dysfunction.

This phenomenon explains the probable oxidative stress and the cytotoxic effects. The deposition of lipids in the vessels lead to hypoxia of placenta which can be the pathological nidus for the development of preeclampsia.

Through this study we have inferred that there is a positive association between deranged lipid profile, increased BMI and development of preeclampsia. Therefore, BMI and lipid profiles monitoring in all pregnancies can be an important tool in predicting the probabilities of development of Preeclampsia and can help minimise the burden of disease as well as can help in preventing major complications in preeclampsia before it manifests.

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