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Original Research Article

# Lipid Profile as a Predictor of Severity of Pre-Eclampsia

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**Abstract:**

**Objectives:** The present study was to assess the abnormal lipid profile as a diagnostic marker for the prediction of pre-eclampsia and its severity.

**Methods:** A total of 100 pregnant women with age 18-35 years were enrolled. All the subjects were divided in two groups. 50 pregnant women who had been clinically diagnosed with pre-eclampsia were included in case group and 50 pregnant healthy women were included in control group. Proper precautions were taken while collecting blood samples to ensure safety of self and to the patient. Quantitative estimation of total cholesterol was done by Modified Roeschlau's Method. Quantitative estimation of high-density lipoprotein was done by phosphotungstic acid precipitation Method. Quantitative estimation of triglycerides was done by Trinder method. Quantitative estimation of LDL-C and VLDL-C was done by Friedwald equitation's.

**Results:** Most of the women of Preeclampsia were seen in age group 20-24 years. Mean age of Preeclamptic woman was 21.24 years and normal pregnant woman was 23.75 years. Mean ± standard deviation of cholesterol, triglyceride, VLDL, HDL and LDL of pre-eclamptic women was statistically significant differences ($p<0.001$) as compared to normal healthy pregnant women.

**Conclusions:** Mean levels of cholesterol, triglyceride, VLDL and LDL were raised in pre-eclamptic women while the levels of HDL was decreased in pre-eclamptic women as compare to normal pregnant women. Hence, the monitoring of lipid profile can be used as an early assessment tool or early marker in the prediction of pre-eclampsia and its severity. Therefore, estimation of these biochemical parameters is useful to prevent pre-eclampsia to reducing the undesiredoutcome in pregnancy.

**Keywords:** Pregnancy, Pre-Eclampsia, Lipid Profile.



## Introduction

Pre-eclampsia is a hypertensive multisystem disorder of pregnancy that significantly contribute to maternal and fetal/neonatal morbidity and mortality (American college of Obstetrician and Gynaecology [1,2].

In India the incidence of PE is reported to be 8-10% among the pregnant women. Worldwide about 76,000 pregnant women die each year from PE and hypertensive related disorder. In Asia and Africa, nearly one tenth of all maternal deaths are associated with hypertensive disorder of pregnancy. The number of babies who die from these disorders is thought to be on the order of 5,00,000 per year [3,4].

Alteration of hormones during normal pregnancy result in slight alteration of serum lipids level, usually levels of which revert to normal shortly after delivery. Compared to normal pregnancies, in PE endocrinological alterations are more [5], in turns there will be more change in serum lipids level among pre-eclamptic women. Abnormal lipid profile is associated with various disorders like cardiovascular diseases, endothelial dysfunction, decreases in PGI: $TxA_2$. Decrease in PGI: $TxA_2$ is supposed to be one of the causes for pathogenesis of PE [6]. Women with Pre-eclampsia present arterial lesions at the uteroplacental implantation site. These morphological lesions are usually observed in case of acute atherosclerosis and characterized by areas with fibrinoid necrosis surrounded by lipid-laden macrophages. Lipid deposition is also seen in glomeruli of pre-eclamptic patient, a finding known as glomerular endotheliosis [7]. Thus, abnormal lipid metabolism seems important in the pathogenesis of pre-eclampsia. Objectives of our study was to

evaluate the abnormal lipid profile as a predictor of severity of pre-eclampsia.

## Material & Methods

The present Study was carried out in Department of Biochemistry, Nalanda Medical college, Patna during a period from February 2017 to October 2017. The study was carried out on 100 pregnant women with gestational age ≥20 weeks coming for antenatal assessment in the OPD or admitted under department of Gynaecology and obstetrics., Nalanda Medical College and Hospital, Patna. The work was carried out after due clearance and approval from institutional ethical committee. The women were between 18-35 years of age and were selected according to inclusion and exclusion criteria of pre-eclampsia.

**Inclusion Criteria**: Based on diagnostic criteria as per William's obstetrics [8].

**Diagnostic Criteria for Pre-Eclampsia:**

**Minimum Criteria**

- Blood pressure ≥ 140/90 mm Hg
- Proteinuria ≥ 300mg/24 hr or ≥ 1+ dip-stick

**Criteria for Severs Pre-Eclampsia:**

- Blood pressure ≥ 160/110 mm Hg after 20 weeks of gestation
- Proteinuria ≥2 gm/24 hours or ≥ 2+ dip-stick
- Serum creatinine >1.2 mg/dl unless known to be previously elevated
- Platelets < 100,000/mm³
- Microangiopathic haemolysis
- Persistent headache or other cerebral or visual disturbances
- Persistent epigastric pain

**Exclusion Criteria:**

1) Presence of UTI

2) History of hypertension, diabetes mellitus and drug intake, alcoholism, liver disorder, cardiac disorder, renal disorder, and any other major illness.

All the subjects were divided in two groups.

**Group 1 (Case):** 50 pregnant women who had been clinically diagnosed with pre-eclampsia (both primigravida and multigravida) according to inclusion criteria were enrolled.

**Group 2 (Control):** 50 Healthy normotensive pregnant women were included in control group.

All the demographic profile, clinical symptoms, physical examinations and related investigations of all pregnant women were performed.

**Methods:**

**Collection of Blood Sample:** Proper precautions were taken while collecting blood samples to ensure safety of self and to the patient. Standard procedures were used to obtain accurate result at every step.

Quantitative estimation of total cholesterol was done by Modified Roeschlau's Method [9].

**Principle:** Cholesterol esters are enzymatically hydrolysed by cholesterol esterase to cholesterol and fatty acid. Free cholesterol, including that originally presents, then oxidized by cholesterol oxidase to cholest-4-en-3-one and hydrogen peroxide. The hydrogen peroxide combines with 4-amino antipyrine to form a chromophore (quinonimine dye) which may be quantified at 505 nm.

Quantitative estimation of high-density lipoprotein was done by Phosphotungstic Acid Precipitation Method (End Point) [10].

**Principle:** Chylomicrons, LDL and VLDL are precipitated from serum by phosphotungustate in the presence of divalent cations such as magnesium. The HDL cholesterol remains unaffected in the supernatant and is estimated using Cholesterol reagent (Erba).

Quantitative estimation of triglycerides was done by Trinder Method.

**Principles:** Triglycerides are enzymatically hydrolyzed by lipase to free fatty acids and glycerol. The glycerol is phosphorylated by adenosine triphosphate (ATP) with glycerol kinase (GK) to produce glycerol-3-phosphate and adenosine diphosphate (ADP). Glycerol-3-p is oxidized to dihydroxy acetone phosphate (DAP) by glycerol phosphate oxidase (GPO) producing hydrogen peroxide ($H_2O_2$). In a color reaction catalyzed by peroxidase, the $H_2O_2$ reacts with 4-aminoantipyrine (4-AAP) and 4 chlorophenol (4- CP) to produce a red colored dye. The absorbance of this dye is proportional to the concentration of triglyceride present in the sample [11].

Quantitative estimation of LDL-C and VLDL-C was done by Friedwald equitation's [12]. In this method, Total Cholesterol, Triglycerides and HDL-C (High density lipoprotein Cholesterol) are directly estimated using reagent.

All the tests were performed under the expert supervision of guide and theresults were recorded.

**Statistical Analysis:** Data was analysed by using SPSS software. Mean ± Standard deviations were calculated. P-value was taken less than or equal to 0.05 ($p \leq 0.05$) for significant differences.

## Observations & Results

In the present study, majorities of women with pre-eclampsia were seen in age group 20-24 years. Mean age of Preeclamptic woman was 21.24±4.66 years and normal pregnant woman was 23.75±3.36 years. The difference was significant (P<0.001). Most of the pre-eclamptic women (70%) were in first gravida.

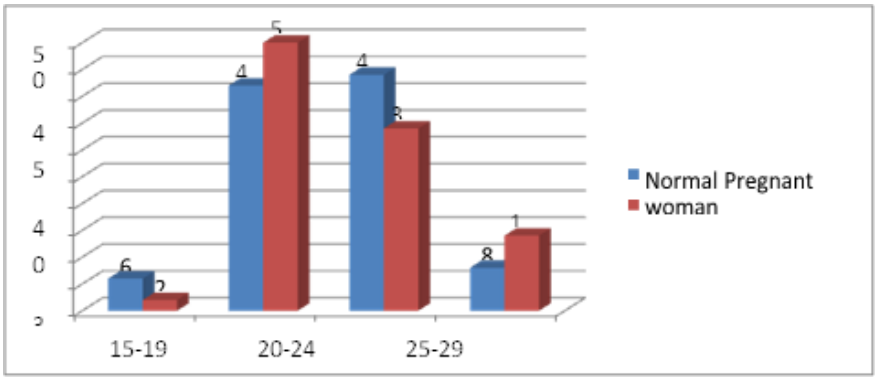


**Figure.1. Age wise distributions of pregnant women**

Maximum cases of preeclampsia were seen in 32 and 36 weeks of gestational age. Mean gestational age in preeclampsia was 32.11±3.01 weeks and in normal pregnant woman was 27.34±5.12 weeks. It was significant differences (P<0.001).

In the present study, maximum preeclamptic women (38%) had body weight in range of 60-64kg followed by 26% in range of 55-59 kg. Mean body weight in preeclamptic women was 57.46 kg and that in normal pregnant women was 50.96 kg. The difference in weight between two group was significant with P<0.001. In Preeclampsia 38%of women were average build, 46 % were obese and 16% were thin built. Pulse rate in preeclamptic women were in range of 60- 120 beats/min while in normal pregnancy the range is 60-90 beats/min. The difference of pulse rate was significant in two group with P<0.001. In Preeclampsia the range of systolic blood pressure was 130-210mm of Hg. Mean value was 142.01 mm of Hg. In normal pregnancy range of systolic blood pressure was 100-120 mm oh Hg. Mean value was 103.17 mm of Hg. The difference in systolic blood pressure in two group was significant with P<0.001. Diastolic blood pressure in preeclamptic women was in range of 90-120 mm of Hg. Mean value was 91.26 mm of Hg. In normal pregnancy the range was 60-80 mm of Hg with mean value of 70.07. The difference in diastolic blood pressure between two group was significant with P<0.001.

**Table 1: Showing mean levels of cholesterol in preeclampsia andnormal pregnant women**

| Group | Range | Mean | SD | t-value | P-value | Sig |
|---|---|---|---|---|---|---|
| **Normal Pregnancy** | 145-200 | 178.01 | 19.12 | | | |
| **Pre-eclampsia** | 170-280 | 224.71 | 29.22 | 9.42 | <0.001 | *** |

Cholesterol in preeclamptic women was in range of 170-280 mg/dl. Mean value was 224.71mg/dl. In normal pregnancy the range was 145-200 mg/dl with mean value of 178.01. The difference in two group was significant with P<0.001.

**Table 2: Showing mean levels of TG (mg/dl) in pre-eclampsia andnormal pregnant women**

| Group | Range | Mean | SD | t-value | P-value | Sig |
|---|---|---|---|---|---|---|
| **Normal Pregnancy** | 145-200 | 178.01 | 19.12 | | | |
| **Pre-eclampsia** | 170-280 | 224.71 | 29.22 | 9.42 | <0.001 | *** |

In the present study, TG in preeclamptic women was in range of 160-289 mg/dl. Mean value was 207.19 mg/dl. In normal pregnancy the range was 103-190 mg/dl with mean value of 150.04. The difference in two group was significant with P<0.001.

**Table 3: Showing mean levels of VLDL (mg/dl) in preeclampsia andnormal pregnant women.**

| Group | Range | Mean | SD | t-value | P-value | Sig |
|---|---|---|---|---|---|---|
| **Normal Pregnancy** | 20-42.5 | 31.36 | 10.41 | | <0.001 | *** |
| **Pre- eclampsia** | 30-55 | 42.75 | 6.67 | -6.65 | | |

In the present study, VLDL in preeclamptic women was in range of 30-55 mg/dl. Mean value was 42.75mg/dl. In normal pregnancy the range was 20-42.5 mg/dl with mean value of 31.36mg/dl. The difference in two group was significant with P<0.001.

**Table 4: Showing mean levels of LDL (mg/dl) in preeclampsia andnormal pregnant women**

| Group | Range | Mean | SD | t-value | P-value | Sig |
|---|---|---|---|---|---|---|
| **Normal Pregnancy** | 47-126 | 93.65 | 21.82 | | | |
| **Pre- eclampsia** | 90.186 | 132.77 | 27.83 | -8.27 | <0.001 | *** |

LDL in preeclamptic women was in range of 90-186 mg/dl. Mean value was 132.77mg/dl. In normal pregnancy the range was 47-126 mg/dl with mean value of 93.65mg/dl. The difference in two group was significant with P<0.001.

**Table 5: Showing mean levels of HDL (mg/dl) in preeclampsia andnormal pregnant women.**

| Group | Range | Mean | SD | t-value | P-value | Sig |
|---|---|---|---|---|---|---|
| **Normal Pregnancy** | 37-70 | 53.22 | 10.66 | 2.34 | <0.001 | *** |
| **Pre- eclampsia** | 38-56 | 49.18 | 6.01 | | | |

HDL in preeclamptic women was in range of 38-56 mg/dl. Mean value was 49.18mg/dl. In normal pregnancy the range was 37-70mg/dl with mean value of 53.22mg/dl. The difference in two group was significant with P<0.001.

**Discussions**

Hypertensive disorders during pregnancy, namely pre-eclampsia, is a pregnancy-specific disorder that affects 3-5% [13] of pregnant women worldwide. Pre-eclampsia is one of the most frequently encountered medical complications of pregnancy. Clinically, the condition presents with new onset hypertension and proteinuria after 20 weeks of gestation [14]. In developing countries where access to healthcare is limited, pre- eclampsia is a leading cause of maternal mortality [15], causing an estimated 60,000 maternal deaths worldwide per year. The present study was to find out the abnormal lipid profile as a predictor of pre-eclampsia.

In the present study, total 100 patients were studied and were divided into two groups, Group N and Group P. Group N included 50 normal pregnant women and Group P included 50 pre-eclamptic women. All the subjects were in age group of 15-35 years.

Most of the pre-eclamptic women were in age group of 20-30 years with maximum percentage (50%) in age group 20-24 years. The mean age was 21.24± 4.66 (21±5) years. This age incidence of pre-eclamptic women was in conformity of other research workers like N.R. Hazari et al (2014), Sreelatha et al (2015), Dr. Mohd Sabiullah et al (2015).

In the present sgtudy, out of 50 pre-eclamptic women, 35 cases (70%) were primigravida while 15 cases (30%) were multigravida. In normal pregnant women, 15 cases (30%) were primigravida while 35 cases (70%) were multigravida. This comparative study shows pre- eclampsia was common in primigravida. This result wa also supported by Z. N.Wasu, M Omabe (2009) [16], Ferha Saeed et al (2011) [17], Manjusha Sajith et al (2014) [18].

In the present study, out of 50 pre-eclamptic women, 22% of the patients had gestational age 28 weeks, 26% had gestational age of 32 weeks. Maximum numbers of patients (44%) had gestational age of 36 weeks. The mean gestational age was 32.11±3.01 weeks. This study concluded that pre-eclampsia was common in third trimester of pregnancy. This result is supported by I. Massarenti (2005) [19], E. Del Zolto (2011) [20].

In the present study, mean levels of cholesterol in pre-eclamptic women were in range of 170-280 mg/dl with mean± SD of 224.71±29.22 mg/dl. In normal pregnant women the range was 145-200 mg/dl with mean± SD of 178.01±19.12 mg/dl. It was statistically significant (p<0.001). The present study depicts the mean levels of TG in pre- eclampsia and normal pregnant women statistically was significant differences (p<0.001).

Vani I et al [21] conducted a study in year 2015 and she found that there was a significant increase (p<0.5) in total cholesterol, LDL cholesterol, VLDL cholesterol and triglyceride in pre-eclamptic group compared to normotensive group. There was a significant decrease in HDL-cholesterol in pre-eclamptic group compared to normotensive group.

In the present study, mean levels of VLDL in pre-eclampsia and normal pregnant women was statistically significant differences (p<0.001).

A case control comparative study was done by Gaurang K Anandpara & Dinesh Javarappa in 2014 [22]. They suggested that altered lipid profile with increased triglycerides and decreased HDL levelsin pre-eclamptic patients can be used as an early assessment tool or early marker in the prediction of pre-eclampsia.

In the present study, mean levels of LDL in pre-eclampsia and normal pregnant women were statistically significant differences (p<0.001). Mean levels of HDL in pre-eclampsia and normal pregnant women was also statistically significant differences (p<0.001).

A study conducted by Vibhuti Agrawal et al in 2014, it was seen that mean level of total cholesterol was 205.54±27.50 mg/dl in pre-eclampsia while 165.52±19.24 mg/dl in normal pregnant women, mean level of HDL in pre-eclampsia was 34.88±6.52 mg/dl while in normal pregnant women

it was, 37.98±11.21 mg/dl, mean level of LDL was 116.4±24.82 mg/dl in pre-eclampsia while in normal pregnant women it was 104±19 mg/dl, the mean level of VLDL in pre-eclampsia was 47.86±7.89 while innormal pregnant women it was 26.78±2.19 mg/dl, mean level of triglyceride was 239.3±39.54 in pre-eclampsia while in normal pregnant women 134±11.56 mg/dl. They concluded that there exists an association in lipid profile with pre-eclampsia.

In the present study, mean levels of cholesterol between the two groups in each age interval was significantly increased level of cholesterol in pre-eclamptic women as compare to normal pregnant women. Mean levels of TG between the two groups in each age interval was significantly increased level of TG in pre-eclamptic women as compared to normal pregnant women.

Naf islam (2010) [23] reported that mean triglycerides (225.6±28.93 Vs 165.6±17.27) levels are significantly higher in group of women who had pre-eclampsia as compared to normal control ($p<0.05$) while mean HDL- cholesterol (42.4±9.23 Vs 55.7±7.11) levels were significantly lower in women with pre-eclampsia than in normal control ($p<0.05$). They suggested that the women who developed PE and eclampsia had disturbed lipid profile due to abnormal lipid metabolism. Increased triglyceridelevel and delayed triglyceride clearance and high blood pressure are the reason for the development of PE and eclampsia.

In the study, we were found that Pre-eclampsia commonly occurs in the fertile period of women between 18-34 years of age and the greater prevalence of it occurs in primigravida. The disease is more common in third trimester of pregnancy and the incidence of disease increases with increase in weight. Clinical finding shows pulse rate is generally higher in pre-eclamptic women compared to normal pregnant women. Both systolicand diastolic blood pressure is higher in pre-eclampsia. Blood pressure is an indicator for the severity of pre-eclampsia.

In this study, a statistically significant decrease in HDL-C is observed in pre-eclamptic women. The finding reported in our study corroborates the growing numbers of studies showing that women with pre-eclampsia present lipid profile abnormalities. Also a positive correlation exert between dyslipidemia and systolic B.P in pre-eclampsia.

Currently the diagnosis of pre-eclampsia is based on clinical symptoms that are noticeable at the end of second trimester. Clinical alarm is always late. Therefore, greater attention should be paid on the biochemical action associated with the development of PE.

## Conclusions

The present study concluded that the mean levels of cholesterol, triglyceride, VLDL and LDL were raised in pre-eclamptic women while the levels of HDL was decreased in pre-eclamptic women as compare to normal pregnant women. Hence, the monitoring of lipid profile can be used as an early assessment tool or early marker in the prediction of pre-eclampsia and its severity. Therefore, estimation of these biochemical parameters is useful to prevent pre-eclampsia to reducing the undesired outcome in pregnancy.

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