

Research Article

Serum Lipid Level in Mother with Pre-eclampsia Attending in a Selected Tertiary Hospital in Bangladesh

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Abstract

Background: Pre-eclampsia is a disorder of pregnancy, characterized by new onset of hypertension and proteinuria that develops after 20 weeks of gestation in a previously normotensive women. Abnormal lipid profile and species may have a role in the promotion of oxidative stress and vascular dysfunction seen in pre-eclampsia. Predominantly the atherogenic low density lipoprotein (LDL) and vascular cell adhesion molecule (VCAM) are increased in association with hyperlipidaemia in pre-eclampsia. There is a pronounced physiological hyperlipidaemia, involving serum levels of triglycerides, and cholesterol in normal pregnancy. Preeclampsia is associated with substantial risks for the mother and fetus. **Methods:** A comparative cross-sectional study was carried out in the department of Obstetrics and Gynaecology, Institute of Child and Mother Health, Matuail, Dhaka Bangladesh from May 2021 to April 2022. Total 42 pregnant women (>20 weeks) with pre-eclampsia and 42 normotensive pregnant women (>20 weeks) were included. All patients were selected according to inclusion criteria. Purposing sampling method was used to collect data from Institute of Child and Mother Health, Matuail, Dhaka Bangladesh. Collected data were analyzed by using computerized methods of analysis (SPSS version 16 and Microsoft Office Excel). **Results:** Total cholesterol levels in Pre-eclampsia group was >200mg/dl in 73.8% patients and <200mg/dl in 26.2% patients. HDL-C levels was <40mg/dl in 16.7% patients and >40mg/dl in 83.3% patients. LDL-C was >159mg/dl in 52.4% and <159mg/dl in 47.6% patients, Triglyceride was >200mg/dl in 92.9% and <200mg/dl in 7.1% patients. In normal pregnancy, Total cholesterol was >200mg/dl in 42.9% and <200mg/dl in 57.1% patients, LDL-C was >159mg/dl in 19.0% and <159mg/dl in 81.0% patients, Triglyceride was >200mg/dl in 73.8% and <200mg/dl in 26.2% patients. Total cholesterol, LDL-C, and Triglyceride were increase in pre-eclampsia when compared to normal pregnancy, which was statistically significant ($p < 0.05$), but no significant difference in HDL-C between two groups ($p > 0.05$). Significant positive pearson's correlation test between blood pressure and levels of total cholesterol, LDL-C, and Triglycerides. Spearman's rank correlation coefficient test. There is a correlation between dyslipidemia and maternal and fetal outcome in both pre-eclampsia and normotensive pregnancy. **Conclusion:** Dyslipidemia is significantly evident in pre-eclampsia and plays an important pathological role.

Keywords

Lipid Profile, Preeclampsia, Dyslipidemia

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1. Introduction

Pre-eclampsia occurs in about 3-5% of pregnancies and is an important cause of fetal and maternal morbidity and mortality worldwide. In healthy pregnancies adaptive changes take place in women's physiology to meet the demands of the rapidly developing fetus. Pre-eclampsia occurs during second and third trimester of pregnancy and it is more common in nulliparous women. It is characterized by blood pressure of 140/90mmHg or rise in systolic blood pressure of more than 30mmHg or diastolic blood pressure of more than 15mmHg after 20 weeks of gestation in conjunction with proteinuria $\geq 300\text{mg}/24$ hours or greater or equal to 1+ or 100mg/dl by dipstick response [5].

Pregnancy is characterized by progressive increases in serum lipids, and this adaptation is essential to promote normal fetal growth and development. It has been observed that the concentration of serum total cholesterol, serum triglyceride, high density lipoprotein cholesterol and low density lipoprotein cholesterol in normal pregnant women increased with increasing gestational age [10]. The present study is undertaken to elucidate any significant variation in the lipid profile during normotensive pregnancy and pre-eclamptic pregnancy to establish if pregnancy affect the lipid profile and to evaluate the clinical significant of the lipid level. in both type of pregnancy.

In the course of normal gestation, serum lipid and lipoprotein levels undergo variations and triglycerides (TGs), cholesterol and phospholipids are elevated. High-density lipoprotein cholesterol (HDL) levels increase until reaching a peak at 25 weeks, decreasing thereafter until the 32 weeks, after which value remain constant until birth.

The pathogenesis of pre-eclampsia is unclear [6] however two important components have been identified, trophoblast cells and accelerated maternal systemic response to trophoblastic tissue.[11]. A two steps model has been described for pathophysiology of pre-eclampsia. The first one pertaining to abnormal placentation leading to placental ischemia causing secretion of soluble factors that induce endothelial dysfunctioning and maternal pre-eclampsia in pregnant women. The second one is related to increase in free radicals and reactive oxygen species causing cell damage and increase vascular tonicity causing pre-eclampsia.

The possible correlation between the altered lipid profile and the severity of renal lesion, as reflected by proteinuria, may contribute towards clarify the complex pathophysiology of pre-eclampsia [3]. The similarity between lesion in PE and in arteriosclerosis has raised speculation about a common pathophysiological pathway. Although data are scarce and inconsistent, marked hyperlipidemia has been observed in PE patients compared to women with pregnancies. PE in thus characterized by profound lipid changes similar to those found in atherosclerosis, including hypertriglyceridemia and relatively increased LDL levels, both of which play a role in endothelial injury and dysfunction. Decreased HDL serum

level were also related to PE [8].

Although several studies have been done on lipid metabolism in normal and pre-eclamptic pregnancies in Europe and USA, very few local studies have focused attention on this important subject, and very little attention has been paid to their clinical correlation. Mild forms of hyperlipidaemia are common during normal pregnancy, but also extreme hyperlipoproteinaemia may occur in the gestational period. In these case, there is usually an underlying genetic disorder (e.g. lipoprotein lipase deficiency, ApoE3/3genotype, disbetalipoproteinaemia). In these genetic disorders, hyperlipoproteinaemia develops when a secondary metabolic factor such as pregnancy occurs [7]. The purpose of this study is to evaluate serum total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL) and High-density lipoprotein (HDL) levels in both normotensive and pre-eclamptic pregnancy and to find out Feto-maternal outcome.

2. Materials and Methods

Study area: The study was conducted in the Department of Obstetrics and Gynaecology, Institute of Child and Mother Health, (ICMH) Matuail, Dhaka-1362. it is a tertiary level hospital in Bangladesh.

Study design: Cross-sectional comparative study.

Study period: 15th may 2021 to 14th April 2022.

Study population: Patients attending in outdoor and indoor of Obstetrics and Gynaecology department.

Sample size: 84 patients were selected purposively for interview.

Questionnaire development: A paper-based questionnaire was developed according to the Inclusion and exclusion criteria.

Data collection technique: A simple questionnaire was used for the data collection by the investigator himself. Data were collected by face to face interview.

Data analysis: Data were analyzed in the computer, with the help of software SPSS program.

3. Results

This cross-sectional comparative study between preeclampsia and normotensive pregnant women was conducted among the indoor and outdoor patients of Department of Obs and Gyne in ICMH Matuail Dhaka in 1 (one) year tenure from 15th May 2021 to 14th April 2022 with an ultimate view to evaluate the serum lipid levels in pre-eclampsia and normotensive pregnant women patients. Our sample size was 70 patients per group. But as the sample size was big for the study in only one year period due to unavailability of the cases, we set it to 42 patients in each group (42 patients set as group I pre-eclamptic patient, and 42 patients set as group

II, normotensive pregnant patient).

Between the two groups we compared our observations. Hypothesis testing was done by the chi square test (Qualitative data), student's t test (Quantitative data) and fisher's Exact test.

Here pre eclamptic patients were set as group I and normotensive pregnant patients were set as group II. The pa-

tients in both group I and group II, were Bangladeshi nation and singleton pregnancies. Main aim of our study was to test the hypothesis "Serum lipid levels increase in women with pre-eclampsia". By testing the hypothesis we choose the effective results by significance (p value <0.05) for our further guideline and protocol of management in this arena.

Table 1. Distribution of study subjects by socio-demographic characteristics (N=84).

	Group I (n=42) n (%)	Group II (n=42) n (%)	p-value
Age (years)			
18 - 25	16 (38.1)	15 (35.7)	
26 - 30	19 (45.2)	19 (45.2)	
31 - 35	7 (16.7)	8 (19.0)	
Mean $\pm$ SD	27.47 $\pm$ 5.37	27.90 $\pm$ 5.50	^a 0.719 ^{ns}
Min - max	18 - 35	18 - 35	
Education			
Primary	15 (35.7)	15 (35.7)	
SSC	14(33.3)	12(28.6)	^b 0.845 ^{ns}
HSC	11 (26.2)	11 (26.2)	
Graduate	2 (4.8)	4 (9.5)	
Occupation			
Housewife	33 (78.6)	30 (71.4)	
Service	5 (11.9)	8 (19.0)	^b 0.659 ^{ns}
Student	4 (9.5)	4 (9.5)	
Monthly family income			
<20,000	27 (64.3)	24 (57.1)	
$\geq$ 20,000	15 (35.7)	18 (42.9)	^b 0.503 ^{ns}

Table 2. Distribution of the study patients by fasting serum lipid profile (n=84).

Lipid profile (mg/dl)	Group I (n=42) n (%)	Group II (n=42) n (%)	OR (95%CI)	p-value
Total cholesterol				
>200	31 (73.8)	18 (42.9)	3.75(1.49-9.43)	0.004 ^s
$\leq$ 200(normal)	11 (26.2)	24 (57.1)		
HDL-C				
<40	7 (16.7)	5 (11.9)	1.48 (0.42-5.10)	0.533 ^{ns}
$\geq$ 40(normal)	35 (83.3)	37 (88.1)		
LDL-C				
$\geq$ 159	22 (52.4)	8 (19.0)	4.67 (1.75-12.45)	0.001 ^s
<159(normal)	20 (47.6)	34 (81.0)		

Lipid profile (mg/dl)	Group I (n=42) n (%)	Group II (n=42) n (%)	OR (95%CI)	p-value
Triglyceride				
≥200	39 (92.9)	31 (73.8)	4.61 (1.18-17.98)	0.019 ^s
<200(normal)	3 (7.1)	11 (26.2)		

p-value derived from Chi-Square test

Table 3. Maternal outcome of the study subjects with dyslipidemia (n=78).

Mode of delivery	Group I Preeclampsia with Dyslipidemia (n=41) n (%)	Group II Normotensive with dyslipidemia (n=37) n (%)	p-value
NVD	14 (34.1)	22 (59.5)	^a 0.024 ^s
LUCS	27 (65.9)	15 (40.5)	
Pre -term labour	18(43.9)	6(16.2)	^a 0.008 ^s
Eclampsia	3(7.3)	0(0.00)	^b 0.277 ^{ns}
HELLP syndrome	1(2.4)	0(0.00)	^b 1.000 ^{ns}

Table 4. Fetal outcome of the study subjects with dyslipidemia (n=78).

Birth weight	Group I Preeclampsia with Dyslipidemia (n=41) n (%)	Group II Normotensive with dyslipidemia (n=37)n (%)	p-value
Low birth weight	13 (31.7)	5 (13.5)	0.057 ^{ns}
Normal weight	28(68.3)	32 (86.1)	

Asphyxiated baby

Referd to NICU 3(7.1) 0(00) ^b0.277^{ns}

IUD 1(2.4) 0(00) ^b1.000^{ns}

Table 5. Maternal outcome of the study subjects with & without dyslipidemia (n=84).

Mode of delivery	Group I (n=42) n (%)	Group II (n=42) n (%)	p-value
NVD	15 (35.7)	26 (61.9)	^a 0.016 ^s
LUCS	27 (64.3)	16 (37.1)	
Pre-term labour	18 (42.9)	6 (14.3)	^a 0.007 ^s
Eclampsia	3(7.1)	0(00)	^b 0.240 ^{ns}
HELLP syndrome	1(2.4)	0(00)	^b 1.000 ^{ns}

Table 6. Fetal outcome of the study subjects with & without dyslipidemia (n=84).

	Group I (n=42) n (%)	Group II (n=42) n (%)	p-value
Birth weight			

	Group I (n=42) n (%)	Group II (n=42) n (%)	p-value
Low birth weight	13 (31.0)	5 (11.9)	0.033 ^s
Normal weight	29 (69.0)	37 (88.1)	
Asphyxiated baby referred to NICU	3(7.1)	0 (0.0)	^b 0.240 ^{ns}
IUD	1(2.4)	0 (0.0)	^b 1.000 ^{ns}

4. Discussion

This cross sectional comparative study was carried out with the aim to compare the serum lipid profiles between pre-eclampsia and normal pregnant women and to see the maternal and fetal outcome. Total 84 singleton pregnant women attending in outpatient department and admitted in the department of Obstetrics and Gynaecology in the Institute of Child and Mother Health (ICMH), Matuail, Dhaka hospital in their second and third trimester were included in this study. Out of which 42 patients with preeclampsia patients considered as (group I) and 42 normotensive pregnant women were labeled as (group II) of the study. These two groups were matched for age and period of gestation.

In this present study 45.2% women were belonged to 26-30 years of age in group I and also 45.2% in group II. The mean age 27.47 ± 5.37 years in group I and 27.90 ± 5.50 years in group II. The age difference was statistically not significant ($p > 0.05$) between two groups. In our country 62.7% of pre-eclampsia patients and 74.7% normotensive pregnant patients were in the age range 20-30 years with mean age of pre-eclampsia patients 23.7 years and normotensive pregnant patients 24.2 years and the difference was not statistically significant ($p > 0.05$) between two groups [2]. The mean age was found 26.85 ± 2.32 years in preeclampsia and 25.7 ± 3.54 years in normal pregnancy [3]. Another study found the mean age was 32.2 ± 5.9 years in preeclampsia and 31.0 ± 4.2 years in normal pregnancy. There was no difference between two groups [9].

On the other hand Mahmood and Nusrat (2017) showed the mean age of the women with preeclampsia was 31.5 ± 4.2 years with range from 21 to 40 years, which is higher with the present study.

In our present study we found 15(35.7%) study subject in both group had complete their primary education. In group I, 14(33.3%) and in group II 12(28.26%) study subject complete their SSC education and 11(26.2%) study subject in both group had complete HSC level education and very few percents study subject completed their graduate level education in both the group. There was no significant statistical difference of education between two groups ($p = 0.845^{ns}$). A study done by [9] showed majority (85%) of the women with pre-eclampsia had some form of formal education while al-

most (96.7%) in control group had formal education ($p < 0.001$). In our study maximum 33(78.6%) study subject in group I and 30 (71.4%) study subject in group II were housewife, 5(11.9%) and 8(19%) irrespective of group I & II were service holder and only 4 (9.5%) study subject in both group were student ($p = 0.659^{ns}$). The occupational distribution pattern between the two groups was similar, less than half of the case (41.7%) and one-fifth of the controls (20%) were unemployed ($p = 0.057$) [9]. In our study monthly income of study subject $< 20,000$ taka in group I, 27 (64.3%) and in group II 24 (57.1%) and $> 20,000$ taka, 15 (35.7%) in group I and 18(42.9%) in group II. The difference between two groups was statistically non significant ($p = 0.503^{ns}$).

In this study, it was observed that 73.8% patients had Total cholesterol (TC) > 200 mg/dl in group I and 42.9% in group II which indicate > 200 mg/dl had OR 3.75(95% CI, 1.49-9.43) times significantly increase to develop preeclampsia and P value 0.004 which was significantly higher in group I. It was observed in this study that 83.3% patients had HDL-C ≥ 40 mg/dl in group I and 88.1% in group II. Which was almost alike ($p > 0.05$) between two groups. Regarding the LDL-C level, 52.4% patients had LDL-C ≥ 159 mg/dl in group I and 19.0% in group II which indicate that LDL-C ≥ 159 mg/dl had OR 4.67 (95% CI, 1.75-12.45) times significantly increase to develop pre-eclampsia., which significantly ($p < 0.05$) higher in group I. Similarly about Triglyceride (TG) 92.9% patients had ≥ 200 mg/dl in group I and 73.8% in group II which indicate ≥ 200 mg/dl had OR 4.61(95% CI, 1.18- 17.98) times increase to develop pre-eclampsia, which is significantly ($p < 0.05$) higher in group I.

Varija T., Veerendra, K. C. M. (2018) conducted a study and observed that higher mean of TC (198.5 ± 18.91), HDL-C (50.63 ± 9.35), LDL-C (84.5 ± 16.16), and TG (74.92 ± 11.95) mg/dl in pre-eclampsia compared to normal pregnancy, which was statistically significant. Among all parameters the differences in TC levels in the two groups were very higher and HDL-C levels were less.

Another study was done by [4] which presented the concentration of TC (232.0 ± 2.9 vs 219.1 ± 3.1) LDL-C (135.8 ± 4.1 vs 115.7 ± 3.4) and TG (270 ± 2.1 vs 215.2 ± 1.9) mg/dl were found to be significantly increased in pre-eclampsia female as compared to normal pregnant females. HDL -C level was significantly lower between two groups (42.1 ± 1.9 vs 60.3 ± 1.2) mg/dl.

Aziz shown their study, there was significantly higher mean TG levels between preeclamptic subjects compared to normal pregnancy group (232.18 ± 106.41 vs 113.12 ± 21.3) mg/dl [1]. While mean HDL-C levels were significantly lower in women with preeclampsia than normal subjects (39.75 ± 11.9 vs 51.18 ± 6.09) mg/dl. Mean TC (177.5 ± 57.19 vs 183.5 ± 12.44), and LDL-C (117.93 ± 12.56 vs 108.43 ± 6.60) mg/dl levels were not statistically different between two groups.

The preeclamptic patients in Kalar et al. (2012) study presented significantly higher serum concentrations of TG (254 ± 0.45 vs 116.59), LDL-C (132.95 ± 32.26 vs 99.36 ± 17.75) mg/dl which were not statistically significant in pre-eclampsia as compared to normal pregnant group ($p < 0.06$).

They also showed significant lower mean concentration of HDL-C (36.92 ± 7.70 vs 51 ± 5.46) mg /dl in pre-eclampsia women indicating a risk factor as compared to normal pregnancy. Total cholesterol (179.53 ± 7.24 vs 182.44 ± 6.89) mg/dl were not statistically significant between two groups.

In this study we observed that there was positive significant correlation among systolic blood pressure (SBP) with total cholesterol ($r = 0.497$; $p = 0.001$), LDL-C ($r = 0.461$; $p = < 0.001$), and Triglyceride ($r = 0.477$; $p = 0.001$) in pre-eclampsia group. Similarly there was positive significant correlation was also found among diastolic BP with total cholesterol ($r = 0.934$; $p = 0.010$), LDL-C ($r = 0.342$; $p = 0.0260$), and triglyceride ($r = 0.317$; $p = 0.041$) in pre-eclampsia group.

In this study table 3 showed that the maternal outcome in both group I and II with dyslipidemia, in group I out of 42 patients, 41 patients were found with dyslipidemia and in group II 37 patients were found with dyslipidemia. In group I 14(34.1%) patients pregnancy were terminated by NVD where as 27(65.9%) patients pregnancy were terminated by LUCS in comparison with group II it was 22(59.5%) and 15(40.5%) respectively. And the differences between two groups was statistically significant ($p = 0.024$). HELLP syndrome develop only 1(2.4%) in group I which is a rare pregnancy complication and it was not statistically significant ($p = 0.495$). Pre-term labour was found 18(43.9%) in group I and 6(16.2%) in group II which differences was statistically significant ($p = 0.008$). Fetal outcome of this two group was found 13(31.7%) low birth weight and 28(68.3%) normal birth weight in group I and 5(13.5%), 32(86.5%) respectively in group II. and the result was not statistically significant ($p = 0.057$). Eclampsia was develop in only 3(7.3%) in group I and none in group II and the difference was statistically non significant.

And Table 5 showed Maternal outcome in group I and II (with and without dyslipidemia) where 15(35.7%) patients pregnancy were terminated by NVD and 27(64.3%) patients pregnancy were terminated by LUCS in group I, and 26(61.9%), 16(37.1%) respectively in group II, which was statistically significant ($p < 0.05$).

HELLP syndrome was develop only 1(2.4%) patients in

group I, and none in group II that was not statistically significant ($p = 0.494$). Pre-term baby deliver was found 18(42.9%) in group I and 6(14.3%) in group II, it was also statistically significant ($p < 0.005$). In group I 3(7.1%) patients had developed eclampsia and in group II none of them had developed eclampsia.

In table VII showed that the fetal outcome in both group I and II with dyslipidemia. In group I out of 42 patients, 41 patients were found with dyslipidemia and in group II 37 patients were found with dyslipidemia. low birth weight 13(31.0%) and normal birth weight 28(68.3%) in group I, and 5(13.5%), 32(86.1%) respectively in group II, the difference between two group was statistically not significant ($p > 0.05$).

Table 6 shows fetal outcome of the study populations (both dyslipidemia and without dyslipidemia). In group I, 13 (31.0%) were found low birth weight baby and maximum 29(69.0%) were found normal birth weight baby. In group II maximum 37(88.1%) were found normal birth weight baby and only 5(11.9%) were found low birth weight baby. The fetal outcome differences between two group was statistically significant ($p < 0.05$). After delivery 3(7.1%) babies were developed asphyxia and referred to NICU and IUD 1(2.4%) in group I and none in group II. Fetal outcome difference between two groups were statistically non significant ($p > 0.05$).

Thus considering the result in this study correlating with the various other studies throughout the world, it can safely be concluded that dyslipidemia is significantly evident in pre-eclampsia and plays an important pathological role. And there is a significant correlation between dyslipidemia with pre-eclampsia and maternal and fetal outcome. The various causative factors for dyslipidemia and its prevention need to be further studied and evaluated.

5. Conclusion

Pre-eclampsia is one of the most serious medical disorder of pregnancy. It is alarming risk for mother and fetus that adversely affects the mother by vascular dysfunction and fetus by intrauterine growth restriction. This study was undertaken to evaluate the association of lipid profile in pre-eclampsia and normal pregnancy. This study concluded that there is elevation of serum lipids among pre-eclamptics when compared to normal pregnancy. It was found that dyslipidemia also affect the maternal and fetal outcome in both pre-eclampsia and normotensive pregnancy. Estimating serum lipid profile is a simple screening test helps to recognize dyslipidemia in early second trimester of pregnancy who are at risk of pre-eclampsia, and it is well established risk factors for pre-eclampsia and early diagnosis of dyslipidemia on antenatal check up and routinely investigate the lipid profile are advocated.

Abbreviations

HDL	High Density Lipoprotein
HELLP	Hemolysis, Elevated Liver Enzymes, and Low Platelets
ICMH	Institute of Child and Mother Health
IUD	Intrauterine Death
LDL	Low Density Lipoprotein
LDL-C	Low Density Lipoprotein Cholesterol
LUCS	Lower Uterine Cesarean Section
NICU	Neonatal Intensive Care Unit
NVD	Normal Vaginal Delivery
TC	Total Cholesterol
TG	Triglyceride

Conflicts of Interest

The authors declare no conflicts of interest.

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