IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 01 Ver. II January. (2018), PP 06-11
www.iosrjournals.org

Serum Lipid Profile in Pre-Eclampsia

*Dr. Sangeeta Naorem[1], Dr. Yanglem Ajitkumar Singh[2], Dr. Ratana Usham[3], Dr. Romita Potsangbam[4], Dr. Prabita Oinam[1], Dr. Soumyadeep Sarma[1], Dr. Rupak Das[1],Dr. Sneha Saha[1], Dr. Nazir A. Sangma[1], Dr. Y. Upen Singh[1]
[1]*(Department of Biochemistry, RIMS, India)*
[2]*(Department of Obstetrics and Gynaecology, RIMS, India)*
[3]*(Department of Obstetrics and Gynaecology, JNIMS, India)*
[4]*(Department of Physiology, JNIMS, India)*
Corresponding Author: Dr. Yanglem Ajitkumar Singh

Abstract
Objective*: To estimate serum lipid profile in normal and pre-eclamptic patients*
Study design and setting*:Case-control study conducted in the Dept. of Biochemistry in collaboration with Dept. of Obstetrics &Gynaecology, Regional Institute of Medical Sciences (RIMS),Imphal (Manipur).*
Materials and Methods*:Data was collected from 50 pre-eclamptic and 25 normotensive pregnant women admitted in Antenatal ward, RIMS Hospital. Blood samples were analyzed for total serum cholesterol, triglyceride, LDL-cholesterol, VLDL- cholesterol and HDL-cholestetol.*
Results*:Total serum cholesterol,triglyceride, LDL-cholesterol and VLDL-cholesterol wassignificantly higher in cases than controls while level of HDL-cholesterol was lower in cases compared to controls. Mean ± SD of total cholesterol was found to be 255.60±70.65 mg/dl incases and207.26±21.80 mg/dl in controls. Mean ± SD serum triglyceride incase and control groups were274.97±127.66 mg/dl and 189.41±41.69 mg/dl respectively. Mean ± SDof LDL level in cases was132.24±61.10 mg/dl compared to103.64±17.18 mg/dl in controls. Mean ± SD of VLDLin case group was55.55±25.91 mg/dl as against 36.92±7.04 mg/dl in control group. Mean ± SD of HDL in control was55.77±9.68 mg/dl as against 45.46±14.13 mg/dl in cases.*
Keywords: *cholesterol, lipid, normotensive, pre-eclamptic, triglyceride.*

Date of Submission:23-12-2017 Date of acceptance: 11-01-2018

I. Introduction

Pre-eclampsia is a type of hypertensive disorder complicating pregnancy and contributes significantly to maternal and perinatal morbidity and mortality. It is a multisystem disorder of unknown etiology characterized by development of hypertension to the extent of 140/90 mmHg or more with proteinuria after the 20th week in a previously normotensive and non-proteinuric patient.[1] Pre-eclampsia occurs in 7-10% of pregnancies worldwide.[2] In India , the national incidence is reported to be 8-10% of all pregnancies.[3] If pre-eclampsia is not diagnosed or treated, it can progress to maternal multiorgan failure, coagulopathy and maternal and fetal death in severe form.[4] Pre-eclampsia affects virtually all maternal organ systems. Early pregnancy dyslipidemia is associated with an increased risk of pre-eclampsia.[5] Despite considerable research, the cause or causes of pre-eclampsia remain unclear and there are no clinically usefulscreening tests to identify women in whom it will develop.[6]Women with a history of pre-eclampsia have significant differences in lipid parameters and an increased susceptibility to lipoprotein oxidation when comparedwith women who had normal pregnancy. Disorders of lipoprotein metabolism are reported to be a major cause of hypertension and proteinuria in pre-eclampsia.[7] In view of the above findings it is postulated that alteration of lipid metabolism may play a key role in the development of symptoms of pre-eclampsia. The present study was designed to investigate the alteration in lipid profile (Cholesterol, triglycerides, LDL-cholesterol, VLDL-cholesterol and HDL-cholesterol) in normal and pre-eclamptic women.

II. Aims And Objects

The present study was taken up in the Department of Biochemistry in collaboration with Department of Obstetrics and Gynaecology, Regional Institute of Medical Sciences Hospital, Imphal to estimate serum level of serum lipid profile in pre-eclamptic patients, normal pregnant women and to compare the findings between them.

III. Materials And Methods

A case control study was conducted to evaluate the level of serum lipid profile in pre-eclamptic patients (cases) and normal pregnant women (controls) admitted in the Antenatal ward in the Department of Obstetrics and Gynaecology. It was done in the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynaecology, Regional Institute of Medical Sciences, Imphal during the period from July 2014 to July 2016.Patients who were diagnosed as pre-eclamptics were taken as the cases and normal pregnant women of comparable gestational age as the controls. Fifty pregnant women in the age group 18 to 45 years having blood pressure≥140/90 mmHg and proteinuria ≥300mg in a 24 hours urine collection after 20 weeks of gestation were recruited as pre-eclamptic cases. Another 25 normal pregnant women of similar age group and gestational age were also taken as controls. 5 ml of fasting venous blood was drawn from anterior cubital vein and analysed for serum lipids.Serum lipid profile estimation were done by Enzymatic Colorimetric Test with lipid clearing factor (LCF) by using kits marketed by Human Gesellschaft fur Biochemica and DiagnositicambH through its Indian branch supply. Estimation of total cholesterol was carried out by the enzymatic CHOD PAP method of Allain CC et al.[8] Triglyceride estimation was done bythe method adopted by Bucolo G and Harold D.[7]Estimation of HDL cholesterol done by precipitation technique described by Steele BW et al.[10] Calculation of the LDL and VLDL cholesterol concentrations was done indirectly by using the formulae of Friedwald T et al.[11]All the cases and controls in the study were subjected to detailed history regarding age, parity, height and weight at the time of blood collection. Maternal education, religion, race, socioeconomic status, menstrual history, obstetric histories were recorded. General physical examinations and systemic examinations with special reference to oedema and blood pressure were carried out. And all the investigations were recorded in the proforma designed for the study. Those patients with preexisting hypertension, cardiovascular or renal diseases, diabetes mellitus or chronic diseases were excluded from the study. Ethical clearance was obtained from the Institutional Ethics Committee, Regional Institute of Medical Sciences, Imphal. Statistical analysis was done using well known statistical formulae like χ^2 - test, independent sample t-test; Pearson correlation coefficient "r" was used.

IV. Results

Table I: Comparison of mean ± SD of blood pressure (mmHg) level between the case and control group

Parameter	Control group	Case group	t-value	df	p-value
	No. (25) Mean±SD	No. (50) Mean±SD			
Systolic	**118.08±10.80**	**155.80±10.65**	**-14.385**	**73**	**< 0.001**
Diastolic	**75.36±7.73**	**103.16±15.37**	**-8.497**	**73**	**< 0.0001**

Table-I shows the comparison of mean ± SD (mmHg) of blood pressure between the cases and controls. It is seenthat the mean ± SD of systolic as well as diastolic blood pressure level in preeclamptic women is much higher than that for normal pregnant women. This difference is found to be very highly significant ($p < 0.0001$)

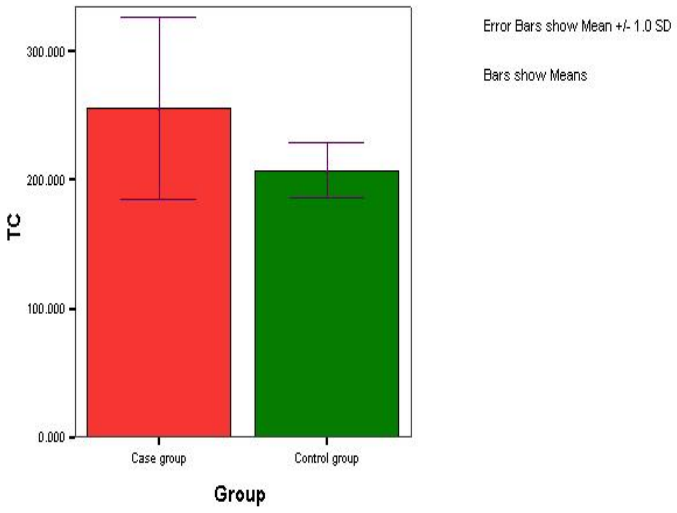

Fig. I Comparison of mean ± SD of total cholesterol (mg/dl) between the case and control group

Fig.I shows the comparison of total serum cholesterol level between the case and control groups. Mean ± SD of total cholesterol (mg/dl) is found to be higher in cases than controls(255.60±70.65 mg/dl and207.26±21.80 mg/dl respectively).The difference between the two groups is highly significant (p = 0.001).

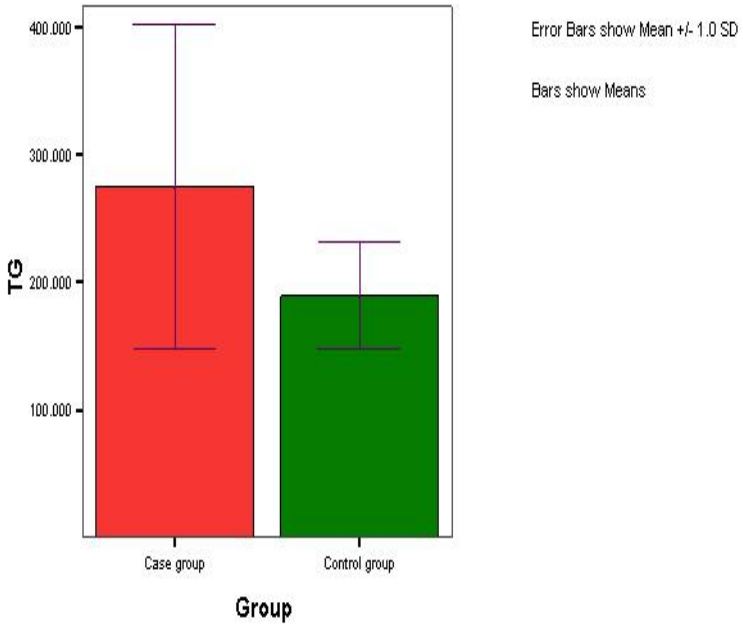

Fig. II: Comparison of mean ± SD of triglycerides (TG) between the case and control group

It is evident from Fig. II that that total serum triglyceride level in the case group is higher than the control group. The mean ± SD (mg/dl) in the case and control groups are274.97±127.66 and 189.41±41.69 respectively. The difference is statistically significant (p = 0.002).

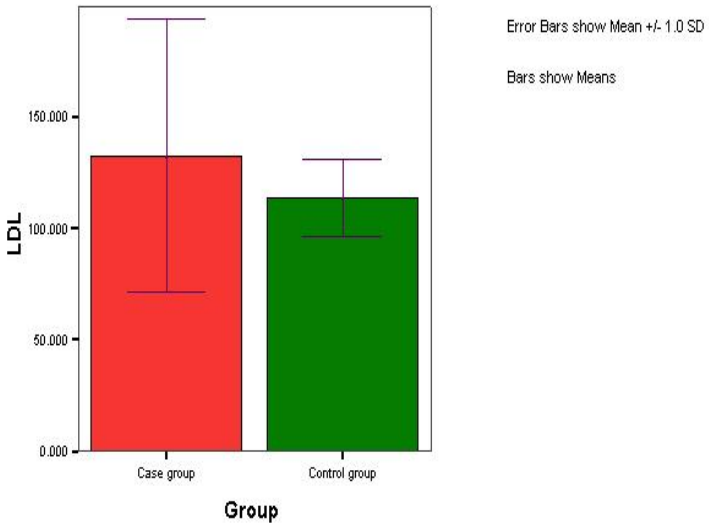

Fig. III: Comparison of mean ± SD of low density lipoprotein(LDL) between case and control group

Fig. III shows that low density lipoprotein (LDL) level is elevated in the preeclamptic cases compared to controls. Mean ± SD (mg/dl) in cases is 132.24±61.10 compared to103.64±17.18 in controls. The increased in cases is found to be statistically significant as evident from the p-value (p = 0.001).

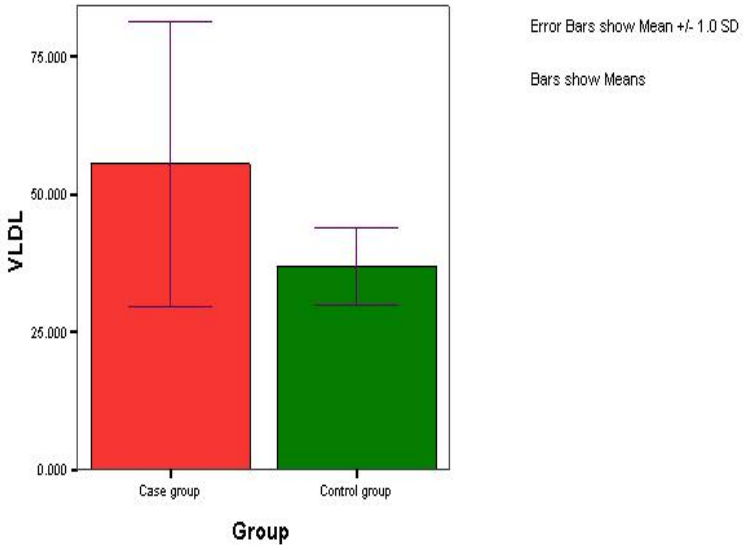

Fig. IV: Comparison of mean ± SD of very low density lipoprotein (VLDL) between the case and control group

It is evident from Fig. IV that the level of very low density lipoprotein (VLDL) is significantly higher in women with preeclampsia compared to the normal pregnant women (p = 0.001). The mean ± SD (mg/dl) in the case group is 55.55±25.91 as against 36.92±7.04 in the control group.

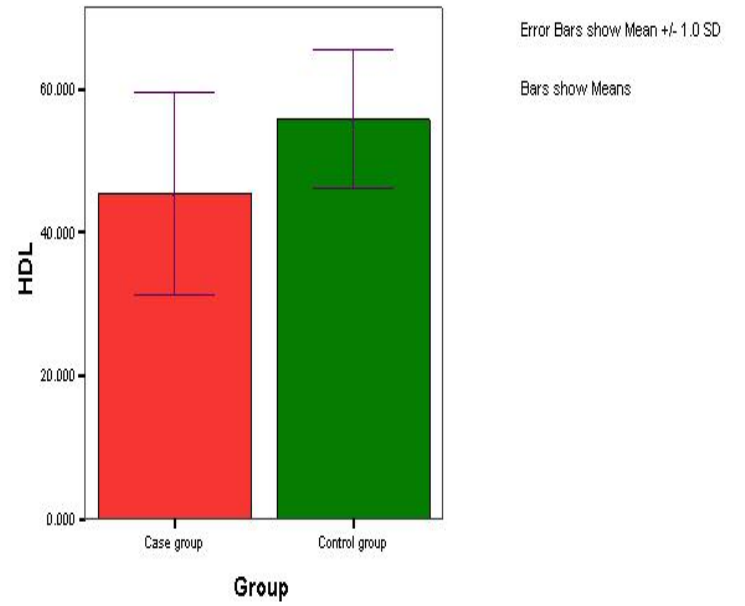

Fig V: Comparison of mean ± SD of high density lipoprotein (HDL) between the case and control group

It is evident from Fig. V that the level of high density lipoprotein (HDL) is significantly higher in the control group compared to the cases (p = 0.002). The mean ± SD (mg/dl) of control is 55.77±9.68 as against 45.46±14.13 in the controls.

V. Discussion

In this study we investigate the role of lipid profile in the occurrence of pre-eclampsia. We observed significant increase in serum cholesterol, triglycerides, LDL and VLDL-cholesterol and decreased HDL-cholesterol in pre-eclampsia which provides evidence of abnormal lipid metabolism. The findings are consistent with that of other workers[12]. Similar findings were observed by Anjumet al[13] in hypertensive pregnant women, the serum levels of TC, TGs, LDL and VLDL were significantly high ($p<0.05$) whereas, the serum level of HDL was significantly low ($p<0.05$) when directly compared with that of normotensive pregnant women. The values of the ratios (TC/HDL, TGs/HDL and LDL/HDL) for hypertensive pregnant women were significantly higher as compared to that in normotensive pregnant women. Increased levels of triglycerides with reduced high density lipoprotein cholesterol have also been observed by other studies on pre-eclamptic women.[14,15] During the course of normal pregnancy, plasma triglyceride and cholesterol concentrations rise and as pregnancy progresses both become normal. Hormonal variations during pregnancy affect lipid metabolism.[16] The endogenous female sex hormones have significant effect on serum lipids.[17] During pregnancy the increased level of estrogen causes increased hepatic biosynthesis of endogenous triglycerides through VLDL, this process is modulated by hyperinsulinemia that starts in pregnancy and may result in endothelial cell damage in pregnancy.[18] In PIH, serum triglyceride concentration increases much more notably, two to three times more.[19] The triglycerides are likely to be accumulated in vessels like uterine spiral arteries and contribute to endothelial damage by generating small dense LDL particles. During pregnancy, there is an increase in the hepatic lipase activity and decrease in lipoprotein lipase activity.[17] Hepatic lipase is responsible for the increased synthesis of the triglycerides at the hepatic level, whereas the decreased activity of lipoprotein lipase is responsible for the decreased catabolism at the adipose tissue level, the net effect of which will be an increase in circulating triglycerides and also the second step of uptakeof the remnant chylomicrons by the liver is delayed so it leads to accumulation of triglycerides in plasma as observed during the present study shown in Fig.II . Another hypothesis is that hypertriglyceridemia is probably the consequence of competition between chylomicrons and verylow-density lipoprotein cholesterol for the lipoproteinlipase. Classically, chylomicronclearance occurs in two sequential steps: (1) triglycerides hydrolysis by lipoprotein lipase, (2) uptake of the remnant by the liver. Delay in the second step leads to accumulation of remnants in plasma and is generally thought to represent the atherogenic risk of hypertriglyceridemia. The conclusion ofanother study also indicated that there exists a consistent positive association between elevated maternal TG and the risk of pre-eclampsia.[20] Elevated triglyceride values may compromise vascular function in several ways. For example, triglyceride rich lipoprotein has a prothrombotic activity. Elevated triglycerides might shift the pattern of LDL subclass towards disproportionate increase in smaller denser, more allergenic LDL particles. The association of LDL concentration with preeclampsia is biologically plausible. It has been shown that LDL (specially oxidized LDL) increases artery sensitivity to presser agents and inhibits endothelial-dependant vasodilatation. According to Pirzadoet al[21] there is a direct correlation between adipose tissue lipoprotein lipase activity and plasma HDL cholesterol. This direct correlation may be responsible for low levelsof HDL cholesterol.HDL is one of the four major plasma lipoprotein classes that areinvolved in lipid metabolism and the exchange of cholesterol, cholesterol esters and triacylglycerols between tissues. One function of HDL cholesterol is to facilitate reverse cholesterol transport by carrying excess, potentially harmfully cholesterol from peripheral tissues to the liver, where it can be excreted. In addition, it is involved in activating lipoprotein which releases fatty acids that can be oxidized by the B-oxidation pathway to provide energy. Low levels of HDL-Cholesterol may compromise the function of all these processes. In this study, pre-eclamptic women have been found to have highly significantly deceased levels of HDL cholesterol than the normal pregnant women. This is in consistency with the results of several other studies.[22] However Theresa et al[23] conducted a cross sectional study at the university college hospital Ibadan between July 2010 and December 2010. The results showed that only HDL was significantly higher in the gestational hypertensive group. However, no correlation was found with the other lipid fractions. It therefore shows that gestational hypertension is not associated with hyperlipidemia. This study revealed the different results as compared to our study in respect to LDL, VLDL, total cholesterol and triglycerides level.[23] The dyslipidemia noted in the study is consistent with many studies conducted worldwide over the years. It also stated that early pregnancy dyslipidemia is associated with increased risk of pre-eclampsia. Belo et al[24] in their study concluded that pre-eclamptic women exhibited, in third trimester, higher mean serum triglyceride concentration and lower high density lipoprotein cholesterol. They emphasized that this 'atherogenic' lipid profile in pre-eclamptic females may be a potential contributor to endothelial cell dysfunction. They also stated that hypercholesterolemia promoted the formation of freeradicals.Thus, considering the results 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. The various causative factors for dyslipidemia and its prevention need to be further studied and evaluated.

VI. Conclusion

The study shows that womenwho develop pre-eclampsia had disturbed lipid profile due to abnormal lipid metabolism. Increased triglycerides levels and delayed triglycerides clearance and high blood pressure are the reasons for the development of pre-eclampsia. This association may be significant in understanding the pathological process of preeclampsia and may help in developing strategies for prevention and early diagnosis of preeclampsia. However several potential limitations of our study are worth mentioning. All the cases were pre-eclamptic before the measurement of serum lipid profile and, so it cannot be determined whether the observed elevation in serum lipids preceded the development of pre-eclampsia. So it is needed to be confirmed in a design in which serum lipids are measured before the development of pre-eclampsia or early in pregnancy in order to identify and monitor the patients at risk and thus provide the best prenatal care for these women and their babies.

VII. Recommendations

Despite its relatively small sample size, the present study provides evidence of usefulness of estimation of serum lipid profile as a convenient and sensitive biomarker for the prediction of pre-eclampsia. Prospective and population based studies on a large scale are however required to confirm the associations.

References

[1]. Adegoke OA, Iyare EE,Gbenebitse SO. Fasting plasma glucose and cholesterol levels in pregnant Nigerian women. Niger Postgrad Med J. 2003; 10(1):32-6.
[2]. MutluTurkoglu U, Ademoglu E. Imbalance between lipid peroxidation, antioxidant status in pre eclampsia. GynecolObstet Invest. 1998; 46(1):37-40.
[3]. Gohil JT, Patel PK, Gupta P. Estimation of Lipid Profile in Subjects of Pre-eclampsia. J ObstetGynecol India 2011;61(4):399-403.
[4]. Friedman SA, Taylor RN and Roberts JM. Pathophysiology of preeclampsia, Clin Perinatol1991; 18(4):661-82.
[5]. Enquobahrie DA, Williams MA, Butler CL, Frederick IO, Miller RS, Luthy DA. Maternal plasma lipid concentrationin early pregnancy and risk of preeclampsia. Am J Hypertens 2004;17(7):574-81.
[6]. Caren G, Solomon, Seely EW. Preeclampsia-searching for cause. N Engl J Med 2004;350(7):641-2.
[7]. Gractacose E, Casals E, Gomez O, Llurba E, MercaderI, Carach V, et al. Increased susceptibility to low density lipoprotein oxidation in women with a history of pr-eclampsia. Br J ObstetGynaecol2003;110(4):400-4.
[8]. Allain CC, Poon LS, Chan CS, Richmond W, Fu PC. Enzymatic determination of total serum cholesterol, ClinChem1974; 20(4):470-475
[9]. Bucolo G and Harold D: Qualitative determination of serum triglycerides by the use of enzymes, Clin Chem1973; 19(5):476-82.
[10]. Steele BW, Kocher DF, Azar MM, Blaszkowski TP, Kuba K, Dempsey ME. Enzymatic determinations of cholesterol in high density lipoprotein fractions, prepared by precipitation technique, Clin Chem1976; 22(1):98-10.
[11]. FriedwaldWT, Levy RI, Fredickson DS. Estimation of the concentration of low density cholesterol in plasma; plasma without the use of preparative ultracentrifuge.Clin Chem1972; 18(6):499-502.
[12]. Nayan S, Meena ML, Hooja N, Fatima A, Singh N, Aseri S. A study of comparison of serum lipid profile of women with pregnancy induced hypertension and normal pregnancy. SchAcad J Biosci 2014; 2(11):834-6.
[13]. Anjum R, Zahra N, Rehman K, Alam R, Parveen A, Tariq M, et al. Comparative analysis of serum lipid profile between normotensive and hypertensive Pakistani pregnant women. J Mol Genet Med 2013; 7: 64.
[14]. Enquobahrie DA, Williams MA, Butler CL, Frderick IO, Miller RS, Luthy DA. Maternal plasma lipid concentration in early pregnancy and risk of preeclampsia.Am J Hypertens 2004;17(7):574-81.
[15]. Gractacose E, Casals E, Gomez O, Llurba E, Mercader I, Carach V, et al. Increased susceptibility to low density lipoprotein oxidation in women with a history of pr-eclampsia. Br J ObstetGynaecol 2003;110(4):400-4.
[16]. Zollner N, Kirsch K. Colorimetric method for the in vitro determination of serum and tissue total lipids.GesExp Z Med 1962;135:545.
[17]. Patrizia B, Giancarlo T, Franca E, Loreta P, SalvatoreD, Mario M, et al. Lipoprotein metabolism duringnormal pregnancy. Am J ObstetGynecol1999;181(2):430-4.
[18]. Isomaa B, Almgren P, Tuomi T, Forsen B, Lahti K, Nissen M, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes care 2001; 24(4): 683-9.
[19]. Girmancj, Rhodes T, Mercuri M, Pyorala K, Kjeksus J, Pedersen TR, et al. The metabolic syndrome and risk of major coronary events in the scandinavian simvastatin survival study. Am J Cardiol 2004;93(2):136-41.
[20]. Ray JG, Diamond P, Singh G, Bell CM. Brief overview of maternal triglycerides as a risk factor for pre-eclampsia. Br J ObstetGynaecol 2006;113(4):379-86.
[21]. Pirzado ZA, Sangi SA, Mallik R. High density lipoprotein cholesterol (HDL) metabolism and its role inthe ischemic heart disease. Pak J Med Res 1999;38(1):38-41.
[22]. Aziz R,Mahboob T. Preeclampsia and lipid profile.Pak J Med Sci2007; 23(5):751-4.
[23]. Theresa AI, Olumuyiwa AR, Ayo A. Serum lipid levels in pregnant normotensive and gestational hypertensive women in Ibadan, Nigeria. Ann Biol Res 2013; 4(4):204-8.
[24]. Belo L, Caslake M, Gaffney D, et al. Changes in LDL size & HDL concentration in normal and pre-eclamptic pregnancies. Atherosclerosis. 2002; 162(2):425–32.

Dr. Sangeeta Naorem "Serum Lipid Profile in Pre-Eclampsia.”.” IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 01, 2018, pp. 06-11.