

Maternal Serum Triglycerides in Women with Pre-Eclampsia

Mehwish Nisar¹, Majida Zafar², Arfa Tabbassum³, Syeda Batool Mazhar⁴

¹Post Graduate Resident, MCH, PIMS. ²Senior Registrar, MCH, PIMS. ³Associate Professor, MCH, PIMS. ⁴Professor and HOD MCH, Pakistan Institute of Medical Sciences, Islamabad

Address of Correspondence: Dr. Majida Zafar, Senior Registrar, MCH Unit I, PIMS, Islamabad.

E-mail: majidazafar82@yahoo.com

Abstract

Objectives: To determine the frequency of hypertriglyceridemia in women with pre-eclampsia

Study design: Descriptive study.

Settings: Department of Obstetrics and Gynaecology MCH, PIMS Hospital, Islamabad from 7th October 2016 to 6th April 2017.

Materials & Methods: A total of 214 pre-eclamptic women after 20 weeks of gestation between 18 to 40 years of age were included. Patients with other chronic or pre-existing diseases like known hyperlipidemias and metabolic syndrome were excluded. All enrolled women underwent detailed medical history and examination. Blood pressure and proteinuria by dipstick method was checked by a staff nurse. Serum triglyceride levels were done by PIMS laboratory. p-value ≤ 0.05 was taken as significant.

Results: Age range in this study was from 18 to 40 years with mean age of 30.47 ± 5.89 years. Majority of the patients 121 (56.54%) were between 31 to 40 years of age. Mean gestational age was 27.20 ± 4.78 weeks. Hypertriglyceridemia in patients developing pre-eclampsia was found in 61 (28.50%) patients, whereas there was no hypertriglyceridemia in 153 (71.50%) patients.

Conclusion: This study concluded that frequency of hypertriglyceridemia in women with preeclampsia is quite high.

Keywords: Preeclampsia, Lipid profile, Triglycerides.

Cite this article as: Nisar M, Zafar M, Tabbassum A, Mazhar SB. Maternal Serum Triglycerides in Women with Pre-Eclampsia. J. Soc. Obstet. Gynaecol. Pak. 2018; Vol 8(1):24-28.

Introduction

Pre-eclampsia is a multi-organ disorder of pregnancy that manifests after 20 weeks of gestation with new-onset hypertension and proteinuria. Pre-eclampsia is a major contributor to maternal and perinatal morbidity and mortality worldwide, especially in developing countries. In Africa and Asia, they contribute to 9% of deaths.¹

Pre-eclampsia can progress to cause maternal liver dysfunction, renal impairment and ultimately seizures and death. The fetus is affected by

intrauterine growth restriction, preterm birth, stillbirth or neonatal death², and these women have an increased lifetime risk of cardiovascular disease compared with the rest of the population.³

Dyslipidemia (especially hypertriglyceridemia) has been reported as being part of the pre-eclampsia disease process. Hypertriglyceridemia is well documented as an endothelial disruptor in atherosclerosis and is a potential candidate for the endothelial dysfunction seen in this disease. During

Authorship Contribution: ¹ Randomization of patients, data collection, authored the study. ² Literature review and Discussion writing. ³ Reviewed the study, data analysis. ⁴ Conceived the idea, reviewed the study.

Funding Source: none

Conflict of Interest: none

Received: Oct 12, 2017

Accepted: Mar 15, 2018

pregnancy, a progressive increase in serum triglyceride levels is observed. Hormonal variations during pregnancy affect lipid metabolism. During pregnancy, there is an increase in the hepatic lipase activity and a decrease in lipoprotein lipase activity, the net effect of which will be an increase in circulating triglycerides and the second step of uptake of the remnant chylomicrons by the liver is delayed so it leads to accumulation of triglycerides in plasma. Several reports have suggested that women with pre-eclampsia display further changes in lipid metabolism with increases in circulating levels of triglycerides.⁴

Recent studies show that there exists a consistent positive association between elevated maternal triglycerides and the risk of pre-eclampsia. Increased triglycerides levels and delayed triglycerides clearance and high blood pressure are the reasons for the development of preeclampsia. In a study by Dr Urmilla, Women who subsequently developed preeclampsia had 25.3% higher concentration of triglyceride levels than normotensive women.⁵ Similarly in a study by Phalak P, Tilak M there was a significant rise in triglyceride levels in pre-eclampsia as compared to normal pregnancy.⁴

Meta-analysis of the results of the 24 case-control studies show that pre-eclampsia is associated with higher levels of serum triglycerides (95% CI 0.60–0.96, $P < 0.001$)⁶

There are some local studies addressing the relationship between hyperlipidemias and pre eclampsia^{7,8} but there were no local studies about the relationship of pre-eclampsia with isolated hypertriglyceridemia. So, a simple measurement of serum triglyceride levels instead of whole lipid profile is much more beneficial and cost-effective in a low socio-economic population of developing countries like Pakistan. With this background in mind, the study was conducted in the Department of Obstetrics and Gynecology to investigate the relationship between serum triglyceride concentration and development of preeclampsia.

Methodology

It is a descriptive case series study conducted in the Department of Obstetrics and Gynaecology, PIMS Hospital, Islamabad from 7th October 2016 to 6th April 2017. The sample size was calculated using

WHO sample size calculator with a margin of error 6%, Confidence level 95% and anticipated population proportion 25.3.⁵ Non-probability, consecutive sampling technique was used. A total of 214 pre-eclamptic pregnant women between 18–40 years of age were included in singleton pregnancy and gestational age of 20 weeks onwards. Women with essential hypertension and any other chronic or preexisting diseases like know hyperlipidemias and metabolic syndrome were excluded. Pre-eclampsia was taken as the occurrence of raised blood pressure of $> 140/90$ after 20 weeks of gestation with positive proteinuria $> +1$ by dipstick method.

Data Collection Procedure: With the approval of the institutional ethics committee, all patients presenting at MCH antenatal clinic and fulfilling the inclusion criteria was recruited after informed verbal consent.

All enrolled women were undergone detailed medical and menstrual history followed by a general, systemic and obstetrical examination. Blood Pressure was checked by outpatient and inpatient MCH staff nurse by a standard method. Proteinuria was checked by dipstick method by MCH staff nurse in daycare OPD and inpatient staff nurse. A venous blood sample was taken for serum triglyceride levels and other routine investigations in non- fasting state by a staff nurse and were done by PIMS laboratory. All information was recorded in a specially designed proforma.

Data was entered in SPSS version 11.0 for analysis. Mean and SD were calculated for quantitative variables like age, gestational age, and parity. Frequencies and percentages were calculated for qualitative variables like triglyceride levels. Effect modifiers like age, gestational age and parity were controlled by stratification. For post-stratification, chi-square was applied. p -value ≤ 0.05 was taken as significant.

Results

The age range in this study was from 18 to 40 years with mean age of 30.47 ± 5.89 years. Majority of the patients 121 (56.54%) were between 31 to 40 years of age as shown in Table I. Mean gestational age was 27.20 ± 4.78 weeks (Figure I). 54% women had parity less than 3 and 45% were above para 3.

Table-I: Age distribution of patients (n=214).		
Age (in years)	No. of Patients	%age
18-30	93	43.46
31-40	121	56.54
Total	214	100.0

Mean \pm SD = 30.47 \pm 5.89 years

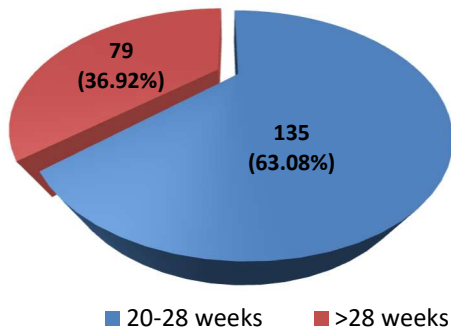


Figure-I: Distribution of patients according to gestational age (n=214).

Hypertriglyceridemia in patients developing pre-eclampsia was found in 61 (28.50%) patients, whereas there was no hypertriglyceridemia in 153 (71.50%) patients as shown in Figure II.

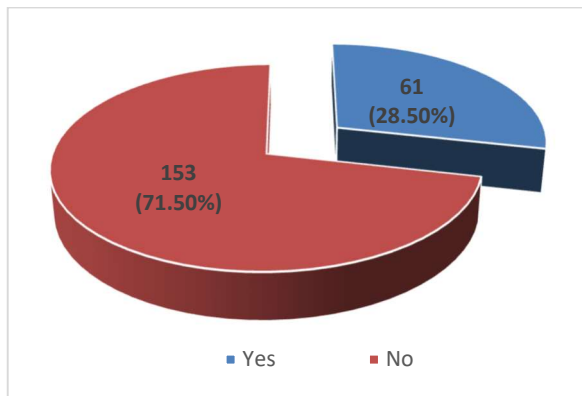


Figure II: Frequency of Hypertriglyceridemia in patients developing pre-eclampsia (n=214).

When Stratification of Hypertriglyceridemia was done on age groups, it was found that there was no significant difference between different age groups (p-value 0.284) as shown in Table II. Similarly, the stratification of Hypertriglyceridemia with respect to gestational age also showed no significant difference between different groups (p-value 0.156). Patients presenting with preeclampsia before 28 weeks had a high prevalence of Hypertriglyceridemia 43 (31.85%) as compared to those presenting after 28 weeks 18

(22.78%). High parity has no significant association with Hypertriglyceridemia (p-value 0.526) as shown in stratification with respect to parity.

Table II: Stratification of Hypertriglyceridemia with respect to age groups, gestational age and parity			
	Hypertriglyceridemia		p-value*
	Yes	No	
Age (years)			0.284
18-30	23 (24.73%)	70 (75.27%)	
31-40	38 (31.40%)	83 (68.60%)	
Gestational Age (weeks)			0.156
20-28 weeks	43 (31.85%)	92 (68.15%)	
>28 weeks	18 (22.78%)	61 (77.22%)	
Parity			0.526
≤3	36 (30.25%)	83 (69.75%)	
>3	25 (26.32%)	70 (73.68%)	

*P \leq 0.05 was taken as level of significance

Discussion

Pregnancy is a hyperlipidemic state which is not atherogenic but under hormonal control.⁹ Women who develop preeclampsia have different serum lipid profile as compared with normotensive pregnant women. Pregnant women with hyperlipidemia and hypertriglyceridemia have increased incidence of developing more severe forms of preeclampsia.¹⁰ Most of the studies have shown increased levels of serum triglycerides concentrations in preeclampsia.¹¹ It is proposed that there may be variants of preeclampsia that can be identified by differences in their lipoprotein profiles as serum triglyceride levels were found raised in mild preeclampsia but severe forms of preeclampsia had triglyceride levels similar to normotensive controls.¹²

As the results of our study show that the age range was from 18 to 40 years. Majority of the patients 121 (56.54%) were between 31 to 40 years of age with a mean age of 30.47 \pm 5.89 years which is similar to the mean age of 29 years in a local study by Nazli R et al.⁸ Whereas the mean age was 27 years in women with severe pre-eclampsia by Baker et al.¹² This is probably because pre-eclampsia is prevalent in young age and primigravida women so mean age corresponds with it and the majority of patients are also in teenage group. Mean gestational age was 27.20 \pm 4.78 weeks while it was 31 weeks in Nazli R et al.⁸ Mean gestational age varies in different

studies depending upon time of sampling for serum triglyceride levels in a first or second trimester. Our study also showed that patients presenting with preeclampsia before 28 weeks had high prevalence of Hypertriglyceridemia 43 (31.85%) as compared to those presenting after 28 weeks 18 (22.78%) which means early presentation of preeclampsia has increased risk of hypertriglyceridemia however overall stratification of gestational age in different groups does not show significant correlation with hypertriglyceridemia (p-value 0.156).

Our study showed that hypertriglyceridemia in patients with pre-eclampsia was found in 61 (28.50%) patients, whereas there was no hypertriglyceridemia in 153 (71.50%) patients. Our results were similar to a study by Dr. Urmilla which showed that women with preeclampsia had 25.3% higher concentration of triglyceride levels than normotensive women.⁵ However, Baker et al¹² showed the prevalence of hypertriglyceridemia as 18% in mild pre-eclampsia which is less as compared to our results probably may be due to early sample collection between 15-20 weeks of gestation by Baker.

A Meta-analysis of 24 case-control studies shows that pre-eclampsia is associated with hypertriglyceridemia (95% CI 0.60–0.96, $P < 0.001$) and the Meta-analysis of the five prospective cohort studies confirms the association of hypertriglyceridemia with pre-eclampsia (95% CI 0.13–0.34, $P < 0.001$).⁶

The association between hypertriglyceridemia and severity of pre-eclampsia at 28-37 weeks gestation was evaluated in a study by Mikhail et al which showed that pregnant women with mild pre-eclampsia had significant hypertriglyceridemia (p-value < 0.01) while in severe preeclampsia serum triglyceride levels were normal showing no association with severity.¹³ This is not comparable to our study because we didn't compare severity in our study parameters. Furthermore, our study showed increased prevalence before 28 weeks of gestation (31.85% vs 22.78%) after 28 weeks whereas Mikhail included women only after 28 weeks.

Gratacos et al¹⁴ evaluated lipid levels at 20 and 34 weeks of gestation and found significantly higher levels of serum triglyceride in women with severe pregnancy-induced hypertension, mild and severe

pre-eclampsia as compared to controls.¹⁴ which is comparable with our study results.

However, Chalas et al¹⁵ found no significant difference in lipid parameters and no association of hypertriglyceridemia with preeclampsia. But it is worth mentioning that he used fasting samples whereas we took samples in the non-fasting state which may be the cause of this discrepancy. Similarly, in a Nigerian study, no difference in triglycerides levels was found in preeclampsia and controls and high-density lipoproteins were found high in controls.¹⁶ which is again not consistent with our findings.

A review by Ray et al¹⁷ reported that 13 out of 22 studies showed a significant association between hypertriglyceridemia and maternal obesity (increased BMI) with preeclampsia. Women with elevated triglycerides had twice the risk of preeclampsia as compared to normal triglycerides levels.¹⁷ We did not include BMI of patients in our study parameters however it was a useful indicator and should have been considered because the positive correlation of this review suggests that pre-pregnancy weight reduction and lifestyle modifications with diet and exercise can reduce the risk of preeclampsia.

It was suggested by Ziaei et al¹⁸ that maternal serum triglyceride assessment between 28 and 32 weeks could be predictive of pre-eclampsia. It was also observed by Chandi et al¹⁹ that raised serum triglyceride levels with a cutoff of 162 mg/dL could predict gestational hypertension with a sensitivity of 76% and specificity of 85%.¹⁹

In a study by Akhavan et al²⁰ the association between hypertriglyceridemia in first trimester and development of severe preeclampsia was evaluated and 84% risk of severe preeclampsia was found in women with hypertriglyceridemia (serum triglyceride > 175 mg/dl) which was about 13 folds increased risk as compared to controls.²⁰ The percentage is very high as compared to 28% in our study but it was in cases of severe pre-eclampsia only not in mild pre-eclampsia which was not a factor in our study and the difference in timings of sample collection should also be kept in mind.

A regional study in India by Vani I et al showed a significant rise in serum triglyceride in pre-eclamptic patients as compared to normotensive pregnant women with a p-value of 0.02.²¹

Pre-eclamptic women have deranged lipid profile and hypertriglyceridemia due to abnormal lipid metabolism. This relationship is very significant in understanding the pathophysiology of pre-eclampsia and may help in developing strategies and measures for prevention and also for early diagnosis and prompt treatment of pre-eclampsia.⁷

Hypertensive disorders of pregnancy are the second major cause of severe maternal outcome (29.7%) after postpartum hemorrhage in Pakistan according to WHO multicounty survey.²² So it is a major health problem for our part of the world and financial burden and simple measures to reduce obesity by controlling pre-pregnancy weight by dietary modifications and exercise would be a great help to reduce hypertriglyceridemia and thus reduce the incidence of pre-eclampsia.

Conclusion

This study concluded that frequency of hypertriglyceridemia in women with pre-eclampsia is quite high. So, we recommend that measurement of serum triglyceride levels only instead of whole lipid profile is much more beneficial and cost-effective in low socio-economic population like our country.

References

- Chaudhry S, Hussain R. Hypertension In Pregnancy: A Review of Preeclampsia, Its Effects and Management :PJMD 2013; 02 : 49-56.
- Gruslin A, Lemyre B. Pre-eclampsia: fetal assessment and neonatal outcomes: Best Pract Res ClinObstet Gynaecol. 2011; 25:491–507.
- Andersgaard AB, Acharya G, Mathiesen EB, Johnsen SH, Straume B, Øian P. Recurrence and long-term maternal health risks of hypertensive disorders of pregnancy: a population-based study. AmJ Obstet Gynecol. 2012; 206: 143.e1–143.e8.
- Phalak P, Tilak M. Study of lipid profile in pre-eclampsia: IJBAMR. 2012; 02 : 405-9.
- Singh U, Yadav S, Mehrotra S, Natu SM, Kumari K, Yadav YS. Serum Lipid Profile in Early Pregnancy as a Predictor of Preeclampsia; IJMRR. 2013; 01: 56-62.
- Gallos ID, Sivakumar K, Kilby MD, Coomarasamy A, Thangaratinam S, Vatisa M. Pre-eclampsia is associated with, and preceded by, hypertriglyceridaemia: BJOG. 2013; 120:1321–1332.
- Kalar MU, Kalar N, Mansoor F, Malik AR, Lessley T, Kreimer S, Abbasi A, Bilal M. Preeclampsia and Lipid levels – Int J Collab Res Intern Med Public Health. 2012;04:1738-45.
- Nazli R, Akhtar T, Lutfullah G, Ahmad J, Haider J, Aslam H. Abnormal Lipid levels as a risk factor of eclampsia, study conducted in tertiary care Hospitals of Khyber Pakhtunkhwa Province - Pakistan. Pakistan J Med Sci. 2013;29:1410–1414.
- Winkler K, Wetzka B, Hoffmann MM, Friedrich I, Kinner M, Baumstark MW, et al. Triglyceride-rich lipoproteins are associated with hypertension in preeclampsia. J Clin Endocrinol Metab. 2003;88:1162–1166.
- Enquobahrie DA, Williams MA, Butler CL, Frederick IO, Miller RS, Luthy DA. Maternal plasma lipid concentrations in early pregnancy and risk of preeclampsia. Am J Hypertens. 2004;17:574–581.
- Ogura K, Miyatake T, Fukui O, Nakamura T, Kameda T, Yoshino G. Low-density lipoprotein particle diameter in normal pregnancy and preeclampsia. J Atheroscler Thromb. 2002;9:42–47.
- Baker AM, Klein RL, Moss KL, Haeri S, Boggess K. Maternal serum dyslipidemia occurs early in pregnancy in women with mild but not severe preeclampsia. Am J Obstet Gynecol. 2009;201:293.e1–4.
- Mikhail MS, Basu J, Palan PR, Furguele J, Romney SL, Anyaegbunam A. Lipid profile in women with preeclampsia: Relationship between plasma triglyceride levels and severity of preeclampsia. J Assoc Acad Minor Phys. 1995;6:43–5.
- Gratacós E, Casals E, Sanllehy C, Cararach V, Alonso PL, Fortuny A. Variation in lipid levels during pregnancy in women with different types of hypertension. Acta Obstet Gynecol Scand. 1996;75:896–901.
- Chalas J, Audibert F, Francoual J, Le Bihan B, Frydman R, Lindenbaum A. Concentrations of apolipoproteins E, C2, and C3 and lipid profile in preeclampsia. Hypertens Pregnancy. 2002;21:199–204.
- Vanderjagt DJ, Patel RJ, El-Nafaty AU, Melah GS, Crossey MJ, Glew RH. High-density lipoprotein and homocysteine levels correlate inversely in preeclamptic women in Northern Nigeria. Acta Obstet Gynecol Scand. 2004;83:536–42.
- Ray JG, Diamond P, Singh G, Bell CM. Brief overview of maternal triglycerides as a risk factor for pre-eclampsia. BJOG. 2006;113(4):379-86.
- Ziaei S, Bonab KM, Kazemnejad A. Serum lipid levels at 28-32 weeks gestation and hypertensive disorders. Hypertens Pregnancy. 2006;25(1):3-10.
- Chandi A, Sirohiwal D, Malik R. Association of early maternal hypertriglyceridemia with pregnancy-induced hypertension. Arch Gynecol Obstet. 2015; 292: 1135-43.
- Akhavan S, Modarres Gilani M, Borna S, Shahghaibi S, Yousefinejad V, Shahsavari S. Maternal plasma lipid concentrations in first trimester of pregnancy and risk of severe preeclampsia. Pak J Med Sci. 2009;25:563–567.
- Vani I, Gayathri A, Nagamani T and Sunieeta H. Lipid profile parameters in normal and preeclampsia complicating pregnancies – A prospective observational study. The Ame J Sci Med Res. 2015;1(1):61-6.
- Aftab S, Mazhar SB, Tabassum A, Bhutta SZ, Tajjamul A. Maternal and Neonatal Outcome of Eclampsia in WHO Multi Country Survey on Maternal and Newborn Health. J. Soc. Obstet. Gynaecol. Pak. 2014;4(4):252-258.