

**Serum Lipid Profile of Women with Pregnancy Induced Hypertension and Normal Pregnancy : A Comparative Study**Anamika Gaurav<sup>1</sup>, Sumit Kumar Suman<sup>2</sup>, Puja Mahaseth<sup>3</sup><sup>1</sup>Senior Resident, Department of Obstetrics and Gynaecology, Darbhanga Medical College & Hospital, Laheriasarai, Bihar<sup>2</sup>M.D. (Medicine), RML, New Delhi, D.M.(Gastro), Gandhi Medical College, Hyderabad<sup>3</sup>Associate Professor, Department of Obstetrics and Gynaecology, Darbhanga Medical College & Hospital, Laheriasarai, Bihar

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Corresponding Author: Dr. Sumit Kumar Suman

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**Abstract:****Background:** Pregnancy induced hypertension is a major cause of fetomaternal morbidity. Studies have shown alteration of serum lipid metabolism in PIH which occur early and may help predicting PIH. The aim of the study was to compare the serum lipid levels in women with pregnancy induced hypertension and normal pregnancy.**Methods:** This case control study was conducted in the Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar from January 2023 to June 2023. A total of 100 (one hundred) were selected, out of which 50 (fifty) normotensive pregnant women served as a control and 50 (fifty) hypertensive women constituted the study group. Besides baseline routine investigations, estimation of Serum lipid profile was done by collecting blood samples from antecubital vein of every case and control and were analysed at department of Biochemistry, DMCH, Laheriasarai, Bihar.**Results:** The hypertensive group had a significant rise in Triglyceride (TG), total cholesterol, LDL-C levels and decreased HDL-C levels as compared to the control group.**Conclusion:** Abnormal lipid profile during pregnancy plays an important role in development of pre-eclampsia.**Keywords:** Pregnancy Induced Hypertension (PIH); Lipid Profile; Pre-eclampsia (PE); Triglycerides (TG), High Density Lipoproteins (HDL-C).This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

PIH is a syndrome of hypertension in pregnancy, with or without edema and proteinuria, which puts both maternal and fetal health at risk. Hypertensive disorders of pregnancy (HDPs) contribute globally to approximately 30,000 maternal and 50,000 perinatal deaths annually.[1,2]

According to National Health Portal, India 2016, the prevalence of HDPs in India was 7.8%, with preeclampsia in 5.4% of the study population. HDPs are classified into 4 categories, as recommended by the National High Blood Pressure Education Program: Gestational hypertension is characterized by new onset hypertension after 20 weeks gestation, followed by return of blood pressure to normal within 3 months post-partum. Early presentation (<32 weeks) along with severity of hypertension, increases the chance of gestational hypertension to progress into preeclampsia or an adverse pregnancy outcome in about 25% of cases.[3,4]

Preeclampsia is broadly defined by hypertension and proteinuria. High blood pressure contributes to widespread damage to maternal kidneys, liver and especially endothelium. Although 3-10% pregnancies are affected with preeclampsia, it is estimated to be 20% in developing countries.[5]

Eclampsia includes preeclampsia with the presence of convulsions not attributable to other neurological diseases. Chronic hypertension is present in up to 5% of pregnant women and is defined as hypertension present before pregnancy or before 20 weeks of gestation.[6]

Superimposed preeclampsia develops in 13-40% women with chronic hypertension depending on diagnostic criteria, etiology, duration and severity of hypertension. [7]

In a multicentre study conducted by National High Blood Pressure Education Program, approximately 30% of HDPs were due to chronic hypertension

while 70% of the cases were diagnosed as gestational hypertension/preeclampsia.

### Material and Methods

This Case control study was conducted at Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar from January 2023 to June 2023.

The sample size calculated 50 in each group. A total of 100 study participants were recruited among which 50 were women with Pregnancy Induced Hypertension who were taken as cases while 50 women who were normotensive were taken as controls.

Women with singleton pregnancy, age between 18-37 years, gestational age between 20-42 weeks and who were known cases of Pregnancy Induced Hypertension were included in this study. Women with eclampsia, multiple pregnancies, severe anaemia, and history of smoking or any chronic medical illness were excluded.

An informed written consent was obtained before recruiting any participants for the study and participants were explained about the objectives of the study.

A thorough general physical examination was done along with ultrasonography for confirmation of gestation age. Routine laboratory investigation was

done viz., CBC, KFT, LFT, HIV, HBsAg, VDRL. Blood pressure was measured by the sphygmomanometer from the right arm while the patient was in semi recumbent position with the arm roughly at the level of heart.

Peripheral blood sample (5ml) was collected from antecubital vein of every case and control and collected in vacutainer and sent to the Department of Biochemistry for analysis. The sample were analysed for serum triglyceride, total cholesterol and HDL-Cholesterol by enzymatic methods with the help of ROCHE diagnostic kit. Serum LDL-C was calculated by using Friedewald equation:  $LDL-C = TC - (TG/5 + HDL-C)$ .

Data was expressed as mean and percentage. Statistical analysis was done using Chi-square, Student T test. Statistical package for social sciences (SPSS- 23) and Microsoft Excel software were used for analysis.  $P < 0.05$  was considered as significant at 95% CI.

### Results

50 Pregnancy Induced Hypertension cases are taken in this study. It is seen most commonly the patients belong to the age group of 20-24 years 26 (52%), followed by 25-29 years 15 (30%). 4 cases are found in the age group of >30 years. The youngest patient is 18 years old, while the oldest is 34 years old in the study.

**Table 1: Table with Age Wise Distribution of Patients**

Age (in years)	No. of Patients	Percentage
<20years	5	10%
20-24years	26	52%
25-29years	15	30%
>30years	4	8%
Total	50	100%
Mean age	23.5	
SD	±4.24	

Out of 50 cases selected for the study, 25 (50%) cases present with SBP between 141-160 mmHg. 13 (26%) of them have SBP between 161-180 mmHg, 9 (18%) have SBP of 181-200 mmHg and 3 (6%) cases present with SBP of >200 mmHg at the time of admission.

**Table 2: Table Showing Distribution of Cases According to Systolic Blood Pressure**

SBP on admission	No. of cases	Percentage
141-160mmHg	25	50%
161-180mmHg	13	26%
181-200mmHg	9	18%
>200mmHg	3	6%
Total	50	100%

Out of 50 cases selected for the study, 10 (20%) are in 91-100 mmHg group, 15 (30%) in 101-110 mmHg group, 20 (40%) in 111-120 mmHg group and 5(10%) cases have DBP >120 mmHg.

**Table 3: Table Showing Distribution of Cases According to Diastolic Blood Pressure**

DBP on admission	No. of cases	Percentage
91-100mmHg	10	20%
101-110mmHg	15	30%
111-120mmHg	20	40%
>120mmHg	5	10%
Total	50	100%

Mean  $\pm$  SD of triglycerides, total cholesterol, and LDL cholesterol among the women in the study group was higher than the Mean  $\pm$  SD of triglycerides, total cholesterol, and LDL cholesterol among women in the control group. Further, Mean  $\pm$  SD of HDL-cholesterol among the study group

was lower than the Mean  $\pm$  SD of HDL-Cholesterol among the control group.

Statistically, there is a significant difference in case of triglycerides, total cholesterol, HDL- cholesterol and LDL-cholesterol.

**Table 4: Mean $\pm$ SD parameters of Serum Lipid Profile (Controls and Cases)**

Parameters	Study Group (Mean+SD)	Control Group (Mean+SD)	p-value
Triglyceride	224.30 $\pm$ 8.41	178.06 $\pm$ 21.02	<0.001
TotalCholesterol	206.82 $\pm$ 9.89	166.64 $\pm$ 18.80	<0.001
HDL-Cholesterol	38.92 $\pm$ 6.09	45.64 $\pm$ 4.69	<0.001
LDL-Cholesterol	119.94 $\pm$ 0.24	90.22 $\pm$ 15.41	<0.001

### Discussion

Recently, there has been much debate about the role of lipid metabolism in the development of Pregnancy Induced Hypertension and Preeclampsia.

Previous research found that plasma lipid levels in women with pre-eclampsia were higher than in healthy pregnant women [8,9]. The lipid changes are thought to contribute to the endothelial cell damage associated with PE. Lipid peroxidation is low in all cells and tissues. Free radical oxidation and antioxidant neutralisation are balanced in good health [10]. Antioxidant nutrients are abundantly used in PE to combat the cellular changes caused by free radicals such as lipid peroxides. Abnormal lipid metabolism is not only a symptom of PE; it also plays a role in its pathogenesis [11].

Based on these findings, the current study was designed to compare serum lipid levels in pregnancy induced hypertension and normal pregnancy. The mean SD serum triglyceride level in the hypertensive group was 224.30 $\pm$ 38.41. The mean SD of serum triglyceride level in the control group was 178.06 $\pm$ 21.02; the difference is statistically significant.

Jayanta De et al[12] and Torun Clausen et al[13] found that hypertensive women had higher triglyceride levels than normotensive women. The mean serum concentration of total cholesterol in the current study is 166.64  $\pm$  18.80 in controls and 206.82  $\pm$  29.89 in cases; the difference is statistically significant. Md. Zakir H et al. [14], S. Ware Jauregui et al. [15], and Shruthi Mohanty et al. [16] found a significant increase in total cholesterol levels in hypertensive women compared to normotensive women. The mean serum

concentration of LDL cholesterol in the current study is 90.22  $\pm$  15.41 in controls and 119.94  $\pm$  20.24 in cases; the difference is statistically significant. Torun Clausen et al[13] and Carlos A. Negrato et al[17] also found a significant increase in LDL-cholesterol levels in hypertensive women compared to normotensive women. In the current study, the mean serum concentration of HDL cholesterol in controls is 45.64  $\pm$  4.69 and in cases is 38.92  $\pm$  6.09, a statistically significant difference.. Carlos A. Negrato et al[17] and S. WareJauregui et al(15) also observed a significant decrease in HDL-Cholesterol levels in hypertensive women compared to normal pregnant women.

### Conclusion

An atherogenic lipid profile with elevated triglycerides, LDL-C, and decreased HDL-C contributes to the development of Pre-eclampsia by causing oxidative stress and endothelial dysfunction, and it plays a significant role in the development of Pre-eclampsia. This research contributes to a better understanding of the role of a changed lipid profile in the pathophysiology of Pregnancy Induced Hypertension and Preeclampsia.

Detecting lipid profile changes in early pregnancy may aid in early diagnosis and the prevention and slowing of disease progression through medication or lifestyle changes.

### References

1. Von Dadelszen P, Magee LA. Pre-eclampsia: anupdate. *Curr Hypertens Rep.* 2014;16(8):1-14.
2. vonDadelszen P, Magee LA. Preventing deaths due to the hypertensive disorders of pregnancy.

- Best Practice Res Clin Obstetr Gynaecol. 2016; 36:83-102.
3. Buchbinder A, Sibai BM, Caritis S, Macpherson C, Hauth J, Lindheimer MD, et al. Adverse perinatal outcomes are significantly higher in severe gestational hypertension than in mild preeclampsia. *Am J Obstet Gynecol*. 2002;186(1):66-71.
  4. Saudan P, Brown MA, Buddle ML, Jones M. Does gestational hypertension become preeclampsia? *Br J Obstet Gynaecol*. 1998;105(11):1177-84.
  5. Direkvand-Moghadam A, Khosravi A, Sayehmiri K. Predictive factors for preeclampsia in pregnant women: a univariate and multivariate logistic regression analysis. *Acta Biochim Pol*. 2012;59(4):673-7.
  6. Lawler J, Osman M, Shelton JA, Yeh J. Population based analysis of hypertensive disorders in pregnancy. *Hypertens Pregnancy*. 2007; 26:67-76.
  7. Ferrer RI, Sibai BM, Mulrow CD, Chiquette E, Stevens KR, Cornell J. Management of mild chronic hypertension during pregnancy: a review. *Obstet Gynecol*. 2000; 96:849-60.
  8. Hubel CA, McLaughlin MK, Evans RW, Hauanth BA, Sims CJ, Roberts JM. Fasting serum triglycerides free fatty acids, and malondialdehyde are increased in preeclampsia, are positively correlated, and decrease within 48 hours of post- partum. *Am J ObstetGynecol* 1996; 174:975-82.
  9. Sattar N, Bendoric A, Berry C, Shepherd J, Greer IA and Packard CJ, Lipoprotein subfraction concentrations in preeclampsia: pathogenic parallels to atherosclerosis *Obstet Gynaecol* 1997; 89(3):403-8.
  10. Aggarwal A, Gupta S, Sharma RK. Role of oxidative stress in female reproduction. *Reprod Biol Endocrinol* 2005; 3:3-28.
  11. Gratacos E. Lipid mediated endothelial dysfunction: A common factor to preeclampsia and chronic vascular disease. *Eur J Obstet Gynecol ReprodBiol* 2000; 92:63-6.
  12. Jayanta De, Anada Kumar Mukhopadhyay and pradip Ku mar Saha. Study of serum lipid profile in pregnancy induced hypertension *Indian Journal of Clinical Biochemistry* 2006; 21(2): 165-168.
  13. Clausen T, Djurovic S, Henriksen T. Dyslipidemia in early second trimester is mainly a feature of women with early onset pre-eclampsia. *BJOG*. 2001; 108:1081-7.
  14. Howlader Z, Kabir Y, Khan T, Islam R, Begum F, Huffman F. Plasma lipid profile, lipid peroxidation and antioxidant status in preeclamptic and uncomplicated pregnancies in Bangladesh. *J Med Sci*. 2007; 7(8): 1276-1282.
  15. Ware-Jauregui S, Sanchez SE, Zhang C. Plasma lipid concentrations in pre-eclamptic and normotensive Peruvian women. *Int J Gynecol Obstet*. 1999;67(3):147-55.
  16. Mohanty S, Nayak N, Nanda N, Rao P. Serum lipids and malondialdehyde levels in primiparous patients with pregnancy induced hypertension. *Indian Journal of Clinical Biochemistry*. 2006; 21(1): 189-192.
  17. Negrato CA, Jovanovic L, Tambascisa MA. Association between insulin resistance, glucose intolerance and hypertension in pregnancy. *Metabol Syndr Rel Disord*. 2009;7(1):53-9.