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An observational study to evaluate the level of serum lipid profile in early second trimester (14-20 Weeks) as predictors of hypertensive disorder of pregnancy

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Abstract
Background: The study aimed to evaluate the level of serum lipid profile in early second trimester (14-20weeks) and to investigate the relationship of lipid profile with development of hypertensive disorder of pregnancy.
Material and Methods: Serum Lipid profile (cholesterol, triglyceride, LDL, VLDL, and HDL) was measured by spectrophotometric principle by enzymatic colorimetric test with lipid clearing factor (LCF) in 140 pregnant women between 13-20 weeks of gestation.
Results: Out of 140 pregnant women, 21 cases developed hypertension with or without proteinuria and 119 remains normotensive. The total cholesterol, triglyceride, LDL, and VLDL levels was increased significantly in women who developed hypertensive disorder of pregnancy while HDL level was decreased.
Conclusion: So finally we conclude that the abnormal lipid profile in second trimester can be considered as an early, economical and noninvasive predictor of hypertensive disorder in pregnancy.

Keywords: Hypertensive disorder of pregnancy, cholesterol, triglyceride, LDL, VLDL, HDL

Introduction
Hypertensive disorder of pregnancy is a multisystem disorder of unknown etiology characterized by hypertension with or without proteinuria developing after 20 weeks of gestation. It affects approximately 5-10% of all pregnancies, mostly primigravidas [1]. The most plausible theory of its central pathogenesis seems to involve the systemic activation and injury of maternal endothelial cells, which manifests as raised BP, proteinuria, systemic inflammatory response, accumulation of anti-antigenic factors which seem to cause the disease by depriving the glomerular endothelial cells of essential growth factors [(2, 3]. Pregnancy termination reverses the clinical manifestation of the disease, suggesting that trophoblastic invasion has a central role in the pathogenesis of hypertensive disorder of pregnancy. A recent study revealed that excessive placental secretion of soluble fms like tyrosine kinase-1 may contribute to HDP [4-8]. Maternal plasma lipids are significantly elevated during pregnancy. There are also evidences suggesting that abnormal lipid metabolism in early pregnancy could be one of the factors for subsequent development of HDP [9]. During pregnancy, the increased level of estrogen causes increased hepatic biosynthesis of endogenous triglycerides through VLDL, this process is modulated by hyperinsulinism that starts in pregnancy and may result in endothelial cell damage in pregnancy. Altered lipid synthesis leading to decrease in PGI2: TXA2 ratio is also supposed to be an important way of pathogenesis in hypertensive disorder of pregnancy. Thus abnormal lipid metabolism seems important in the pathogenesis of Hypertensive Disorder of pregnancy. Therefore, simple measurement of serum lipid parameters may be of good predictive value in toxaemia of pregnancy, avoiding the costly endocrinal investigations [10].

Aims and Objectives
To study the level of serum lipid profile in early second trimester (14-20weeks) as a predictor of hypertensive disorder of pregnancy and to correlate types of dyslipidemia with hypertensive disorder.

Material & Methods

This descriptive type of observational study was conducted on women attending antenatal clinic at early second trimester (gestational age 14-20 weeks) in Department of Obstetrics & Gynaecology, SMS Medical College (Jaipur) From March 2016 to December 2017. Approval from research review committee and ethical board was taken. The allocation was done randomly by coin method. Written informed consent was taken. All patients were evaluated by detailed clinical history, detailed obstetric history, menstrual history, past history, personal history and family history. Gestational age was calculated by LMP & USG. All patients were investigated to routine antenatal investigations Blood pressure was measured by auscultatory method. All patients were investigated for serum lipid profile. Venous blood (3 ml) was collected and tests were carried on the same day. Lipid profile (cholesterol, triglyceride, LDL, VLDL, and HDL) was measured by spectrophotometric principle by enzymatic colorimetric test with lipid clearing factor (LCF). The demographic details such as age, gravida, Religion, residence, socio economic status, and literacy were noted. All Patients were regularly followed till delivery, especially for blood pressure monitoring. Patients were considered hypertensive if the systolic pressure was 140mmHg or more, and /or diastolic pressure of 90mmHg or more, measured on two occasions at least 4 hours apart.

Inclusion Criteria

All women with singleton pregnancy attending ANC at early second trimester (14-20 weeks of gestational age) who were willing to participate in study.

Exclusion Criteria

Women with hypertension diagnosed before 20 weeks of gestation, Diabetes mellitus, Multiple pregnancies, Intrauterine fetal death, Other medical disorders-Thyroid disorder, renal disorder, heart diseases and liver disorder, Chronic smokers and alcoholics.

Results

The study was started with 170 antenatal women with singleton pregnancy between 14 to 20 weeks of gestation. Out of 170 women, 30 women were lost follow up. So data was analyzed from 140 women who completed the study.

Out of 140 cases, 119(85%) were remains normotensive and 21(15%) cases were developed hypertensive disorder.

Table 1. Distribution of study population according to maternal age

Age(years)	Total	%
< 20	9	6.43
21-25	88	62.86
26-30	40	28.57
31-35	3	2.14
Total	140	100

The maximum number of subjects, i.e. 88 (62.86%) belonged to age group 21-25 years. The mean age of the study population was 23.89±3.

Table 2. Distribution of cases according to gravida

Gravida	Total	%
G1	72	51.43
G2	44	31.43
G3	16	11.43
G4	8	05.71
Total	140	100

Maximum subjects that were 72(51.43%) were primigravida, 13 cases out of 21 with HDP were primigravida which suggests that HDP is more common in primigravida,

Table 3. Distribution of study population according to socio-economic status

Socio-economic status	No.	%
Upper	26	18.57
Middle	64	45.71
Lower	50	35.72
Total	140	100

In this study, middle and lower socio-economic group predominated

Table 4. Distribution of study population according to area of residence

Residence	Total	%
Rural	56	40
Urban	84	60
Total	140	100

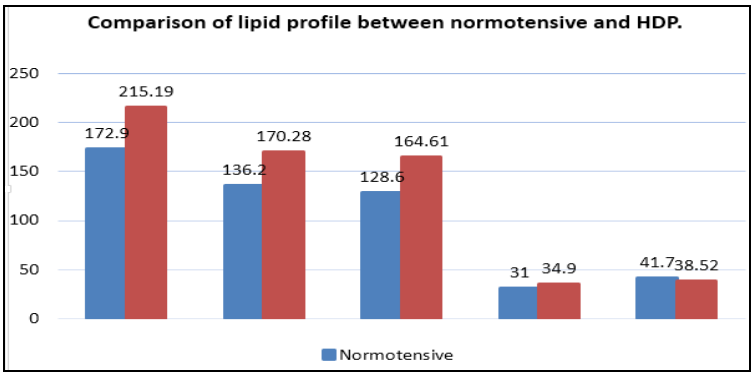
Majority of study population were from urban (60%)

Table 5. Distribution of study population with presence of HDP

status	No.	%
Normotensive	119	85.00
Gestational-Hypertension	12	8.57
Mild Preeclampsia	5	3.57
Severe preeclampsia	4	2.86
Total	140	100

Table 6. Comparison of lipid profile between normotensive and Hypertensive disorder in pregnancy

Lipid Profile	Normotensive (n-119)	HDP (n-21)	Total	P-value
Cholesterol mean±SD	172.90±19.89	215.19±20.10	179.25±24.97	0.001S
Triglyceride mean±SD	136.21±28.96	170.28±23.38	141.32±30.66	0.001 S
LDL mean±SD	128.62±23.30	164.61±11.57	134.02±25.42	0.001 S
VLDL mean±SD	31.00±4.19	34.90±6.11	31.59±4.71	0.005 S
HDL mean±SD	41.71±9.32	38.52±8.67	41.22±9.27	0.148 NS



Discussion

In our study, it was observed that the maximum number of subjects, i. e. 88(62.86%) belonged to age group 21-25 years. The mean age of the study population was 23.89±3. Maximum subjects that were 72(51.43%) were primigravida, 13 cases out of 21 with HDP were primigravida which suggests that HDP is more common in primigravida, Majority of study population were from urban (60%). It was seen in our study that 100(84.03%) cases of normotensive group had cholesterol level less than 200 mg/dl whereas only 6(28.57%) cases of HDP group had cholesterol level less than 200 mg/dl. Similarly cholesterol more than 200mg/dl was seen in 15(71.53%) case of HDP group whereas only 19(15.97%) normotensive had cholesterol more than 200 mg/dl, 89(74.79%) cases of normotensive group had triglyceride level ≤165 mg/dl whereas only 8(38.10%) cases of HDP group had triglyceride level ≤165 mg/dl. Similarly triglyceride more than 165mg/dl was seen in 13(61.90%) case of HDP group whereas 30(25.21%) normotensive had triglyceride more than 165 mg/dl, 99(83.19%) cases of normotensive group had LDL-cholesterol level ≤155mg/dl whereas only 5(23.80%) cases of HDP group had LDL- cholesterol level ≤155mg/dl. Similarly LDL-cholesterol more than 155 mg/dl was seen in 16(76.20%) cases of HDP group whereas 36(25.71%) normotensive had LDL-cholesterol more than 155 mg/dl, 98(89.08%) cases of normotensive group had VLDL-cholesterol level ≤35 mg/dl whereas 8(38.10%) cases of HDP group had VLDL-cholesterol level ≤35mg/dl. Similarly VLDL- cholesterol more than 35mg/dl was seen in 13(61.90%) cases of HDP group whereas 21(10.92%) normotensive had VLDL- cholesterol more than 35 mg/dl, 71(59.67%) cases of normotensive group had HDL-cholesterol level more than 40 mg/dl whereas 9(42.86%) cases of HDP group had HDL-Cholesterol level more than 40 mg/dl. Similarly HDL-cholesterol ≤40mg/dl was seen in 12(47.14%) case of HDP group whereas 48(40.33%) normotensive had HDL-cholesterol <40 mg/dl.

It was observed that the mean cholesterol level in HDP cases was 215.19±20.10 mg/dl and in normal cases was 172.90±19.89 mg/dl, mean triglyceride level in HDP cases was 170.28±23.38 mg/dl and in normal cases was 136.21±28.96 mg/dl, mean LDL level in HDP cases was164.61±11.57 mg/dl and in normal cases was 128.62±23.30 mg/dl, mean VLDL level in HDP cases was 38.90±6.11 mg/dl and in normal cases was 31.00±4.19mg/dl, mean HDL level in HDP cases was38.52±8.67mg/dl and in normal cases was 41.71±9.32 mg/dl. The association of mean cholesterol, triglyceride, LDL and VLDL level among normal and HDP cases were statistically significant (p<0.05) and HDL was statistically not significant (p>0.05). Similar results were seen in another study, done by Singh Urmila, Yadav S, Mehrotra S *et al.* [11]. 2013 conducted study on Serum Lipid Profile in Early Pregnancy as a Predictor of Preeclampsia in 270 pregnant women between 13-20 weeks of gestation. Out of these total number 58 subjects developed preeclampsia (study group) while 212 subjects remained normotensive (control group). The mean serum level of total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C) was significantly higher in preeclamptic women as compared to normotensive pregnant women. While preeclamptic women showed significant fall in high density lipoprotein cholesterol HDL-C) level as compared to normal pregnant women.

K Padma Leela1, G. Rama Devi *et al.* [12]. 2012 Conducted Study on Study of Serum Lipid Profile in Early Second Trimester as Predictor of Hypertensive Disorders Complicating Pregnancy. Out of 112 cases, 9 cases developed hypertension with or without proteinuria and 103 cases had normal blood pressure. Out of 9 cases, 3 women had only gestational hypertension and 6 women had developed preeclampsia. The total cholesterol, triglycerides, LDL, and VLDL levels increased significantly in women who developed hypertension with or without proteinuria subsequently. Out of 9 women who developed hypertension subsequently, 8 women had abnormal lipid profile. Maternal dyslipidemia done at second trimester appears to be a good non-invasive predictor of pregnancy induced gestational hypertension or preeclampsia. Yadav Kiran, Aggarwal Shalini *et al.* [13]. 2011 conducted study on Serum bhCG and Lipid Profile in Early Second Trimester as Predictors of Pregnancy-Induced Hypertension on 120 patients attending the outpatient department of the Obstetrics and Gynaecology of the Maharaja Agrasen Hospital). Out of these cases, 21 cases developed pregnancy-induced hypertension (group II), and 99 cases remained normotensive (group I). In this study, 42.9% of PIH cases had TG level of greater than 200 mg/dl, 71.4% of cases with PIH had elevated cholesterol level [200 mg/dl, 47.6% of group II cases had VLDL value greater than 40 mg/dl and 47.6% of cases in group II have LDL value greater than 130 mg/dl, This showed that TG, cholesterol, VLDL, and LDL values for those women who developed PIH were significantly higher than in the cases of those who remain normotensive, with p value \0.05. They observed no statistical significance between HDL value and pregnancy-induced hypertension the p value is 0.936.

Conclusion

The present study shows that the total cholesterol, triglyceride, VLDL, and LDL were increased and HDL was decreased in hypertensive disorder of pregnancy as compared to normotensive pregnant women. So finally we conclude that the lipid profile can be considered as an early, economical and noninvasive procedure of assessment of severity of HDP cases. Clinically, lipid profile can be a useful screening test for early recognition of patients at risk of HDP before the actual

manifestation and complications of pre-eclampsia and eclampsia for a better fetomaternal outcome.

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