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RESEARCH ARTICLE

STUDY OF LIPID PROFILE IN HYPERTENSIVE DISORDERS OF PREGNANCY

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Abstract

Introduction : Hypertensive disorders complicate 5-10% of all pregnancies. endothelial cell injury are important in the pathogenesis of preeclampsia. Serum lipids have a direct effect on endothelial function. Abnormal lipid metabolism has a basic role in the pathogenesis of the disease. So study of lipid profile may be of good predictive value in hypertensive disorders of pregnancy.

Method: This was a longitudinal study, done in the dept of OBGY, GMERS Medical College, sola, Ahmedabad, from August 2020 to July 2022. 93 women in each group were studied. Outcome was measured by serum lipid level, severity of hypertension, mode of delivery, need for neonatal resuscitation, NICU admission.

Result: Serum Total cholesterol ≥ 240 mg/dl was observed to be 38.7% in group A and 14 % in group B. In group A with normal lipid profile 97.5% had mild hypertension, 2.5% had severe hypertension while in hypertensive with abnormal lipid profile group 53.8% had mild hypertension and 46.2% had severe hypertension. Normal vaginal delivery observed 64.52% in group A and 79.57% in group B. In group A, 35.48% babies and in group B ,5.37% babies required resuscitative measures. NICU admission was needed by 27.95 % in group A and 5.37% in group B.

Conclusion: Serum lipid levels in hypertensive disorders of pregnancy is an important parameter for prediction of adverse perinatal outcome. Hypertensive disorders of pregnancy with dyslipidemia are associated with adverse perinatal outcome as compare to hypertensive disorders of pregnancy without dyslipidemia.

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Introduction:-

Hypertensive disorders complicate 5-10% of all pregnancies. The triad of hypertensive disorders, hemorrhage and infection contribute greatly to the maternal morbidity and mortality¹. In India the incidence of preeclampsia is reported to be 8-10% of the pregnancies². The incidence in primigravidae is about 10% and in multigravidae is about 5%.³ It causes IUGR leading to low birth weight. Low birth weight child is prone to suffer from diabetes, hypertension, and coronary vascular disorders in their later life.⁴

In a hypertensive disorders of pregnancy, there are many theories for pathogenesis, out of which endothelial cell injury in which impaired endothelial function are important in the pathogenesis of preeclampsia. Serum lipids have a

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direct effect on endothelial function. Abnormal lipid metabolism is responsible for the endothelial dysfunction. In toxemia of pregnancy, serum triglyceride concentration increases much more notably. In 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. All the above mentioned interactions along with increased endothelial triglyceride accumulation may result in endothelial cell damage in pregnancy. In PIH, the triglycerides are likely to be accumulated in vessels like uterine spiral arteries and contribute to endothelial damage by generating small, dense LDL particles. Women with PIH are more likely to develop overweight, dyslipidemia, insulin resistance and endothelial dysfunction, which are independent risk factors for cardiovascular disease.⁵ The association of alteration of serum lipid profile in essential hypertension is well documented. An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction.

Therefore, simple measurement of serum lipid parameters may be of good predictive value for hypertensive disorders of pregnancy. So, I decided to take up the study to prove hypothesis: "Abnormal lipid levels during pregnancy can be good predictor for hypertensive disorders of pregnancy".

Material & Methods:-

A Longitudinal study was conducted in the Dept. of OBGY, GMERS Medical College & Hospital, Sola, Ahmedabad, Gujarat.

Total study population was 186 women. They were divided in two groups, 93 women in each group.

The study period is from August 2020 to July 2022.

Study population:

Outdoor and indoor pregnant women, who had following criteria:

(A) Selection criteria for pregnant women with hypertensive disorder:

Inclusion criteria:

All women of age between 18 years to 30 years in third trimester of pregnancy with hypertensive disorder, who had taken antenatal visit at Sola civil hospital, Ahmedabad during this period were included. Maternal BMI was calculated (weight/height^2 , kg/m^2) using maternal weight and height value recorded in first trimester of pregnancy from antenatal visit card.⁶

Exclusion criteria:

Pregnant women with chronic hypertension, collagen vascular disorder, smoking, alcoholism, multiple gestation, familial hyperlipidemia, use of statins as antihyperlipidemic agents. Woman suffering from acute or chronic illness during study or past history of diabetes mellitus, cardiac, hepatic, renal or thyroid dysfunction and if weight and height values were recorded after first trimester of pregnancy were excluded.

(B) Selection criteria for normotensive pregnant women.

Inclusion criteria:

All women of age between 18 years to 30 years in third trimester of pregnancy with normal blood pressure, who had taken antenatal visit at Sola civil hospital, Ahmedabad during this period were included. Maternal BMI was calculated (weight/height^2 , kg/m^2) using maternal weight and height value recorded in first trimester of pregnancy from antenatal visit card.⁶

Exclusion criteria:

Pregnant women with collagen vascular disorder, smoking, alcoholism, multiple gestation, familial hyperlipidemia, use of statins as anti hyperlipidemic agents. Woman suffering from acute or chronic illness during study or past history of diabetes mellitus, cardiac, hepatic, renal or thyroid dysfunction and if weight and height values were recorded after first trimester of pregnancy were excluded.

Sample size:

Based on below sampling technique, the sample size was calculated to be 186 cases.

The case were divided into the following two groups:

Group A - Hypertensive pregnant women - 93 cases

Group B - Normotensive pregnant women – 93 controls

Sampling technique:

Comparison of two means

(Sample size of each group)

$$\frac{(u + v)^2 \times (s_1^2 + s_2^2)}{(\bar{x}_1 - \bar{x}_2)^2}$$

U = power of the study

e.g. If power is 90%, u = 1.28

V = confidence level

e.g if it is 99% , v = 2.58

Comparison of LDL cholesterol on normal and hypertensive pregnant women based on the study conducted by Evruke C et al⁷

Normal = 115.4 ± 33.5 mg/dl

Hypertensive = 137.1 ± 42.0 mg/dl

P value = 0.0001* (p<0.005 means statistically significant)

$$\frac{(1.28 + 2.58)^2 \times \{(33.5)^2 + (42)^2\}}{(115.4 - 137.1)^2}$$

= 93 (sample size of each group) case and control.

Methodology:-

The approval to carry out the study was obtained from institutional ethics committee.

Method of measurement of outcome of interest:

Serum lipid level, severity of hypertension, mode of delivery, need for neonatal resuscitation, NICU admission.

Data collection forms:

All patients participating in study was given patient information sheet. Written consent of participation was taken.

All collected data entered on to the data collection form.

Data collection methods:

In it two groups: **Group A** - Hypertensive pregnant women - 93 cases

Group B - Normotensive pregnant women – 93 controls

The cases and controls matched according to maternal age, gestational age, first trimester body mass index (BMI), in accordance with the selection criteria previously established.

All the women with singleton pregnancies attending antenatal clinics at Sola civil were considered eligible who follow selection criteria for inclusion in the study. Gestational age based on menstrual date, was confirmed through ultrasound. Women with diabetes, chronic hypertension, autoimmune diseases or renal diseases and if weight and height values were recorded after first trimester of pregnancy were excluded. Blood samples were collected from all participants after a 12-hour fast using 5 ml tubes. The blood was sent to central laboratory of GMERS medical college for analysis. The samples were immediately centrifuged and processed using a lab test diagnostic kit. Serum triglycerides (TG), total cholesterol (TC) were analyzed by enzymatic methods using diasys kits on ERBA chem. - 7 semi auto analyzer.

The values of lipid profile, we take as normal lipid profile and abnormal lipid profile - According to ATP III(Adult treatment plan III) - National Cholesterol Education Program Guidelines are taken as follows.⁸

Normal lipid profile:

Total Cholesterol: < 240 mg/dl,

S. Triglyceride: <200mg/dl,

Abnormal lipid profile:

Total Cholesterol : $\geq$ 240 mg/dl,

S. Triglyceride: $\geq$ 200mg/dl,

Statistical methods:

Chi square test was used for statistical analysis.

P < 0.05 is considered statistically significant.

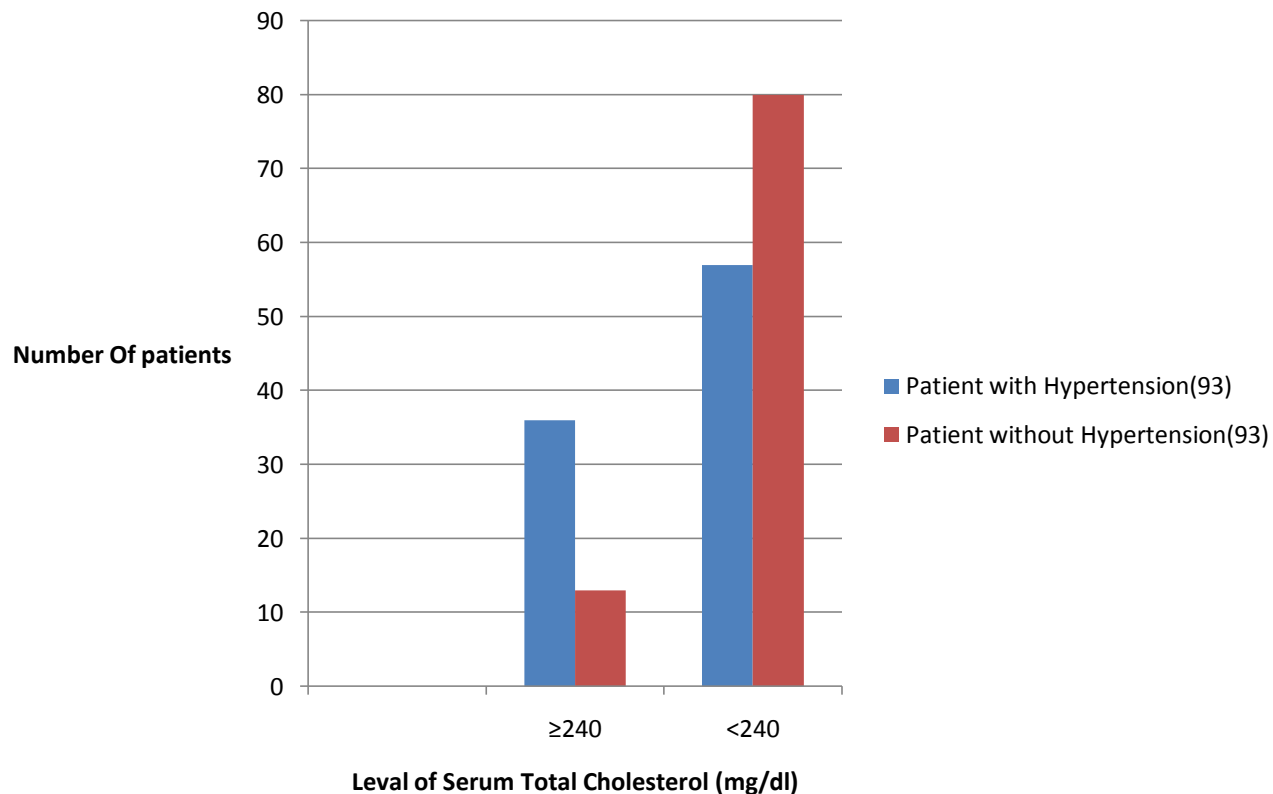
Statistical analysis was performed using SPSS software version 20.

Results:-

Table 1:- Comparison Of Serum Total Cholesterol In Both Group :

Serum Total Cholesterol (mg/dl) ^{8*}	Group-A		Group-B		p value
	No	%	No	%	<0.01
$\geq$ 240	36	38.7	13	14	
<240	57	61.3	80	86	
Total	93	100	93	100	

*Lipid values are according to ATP III (Adult treatment plan iii) guidelines⁸

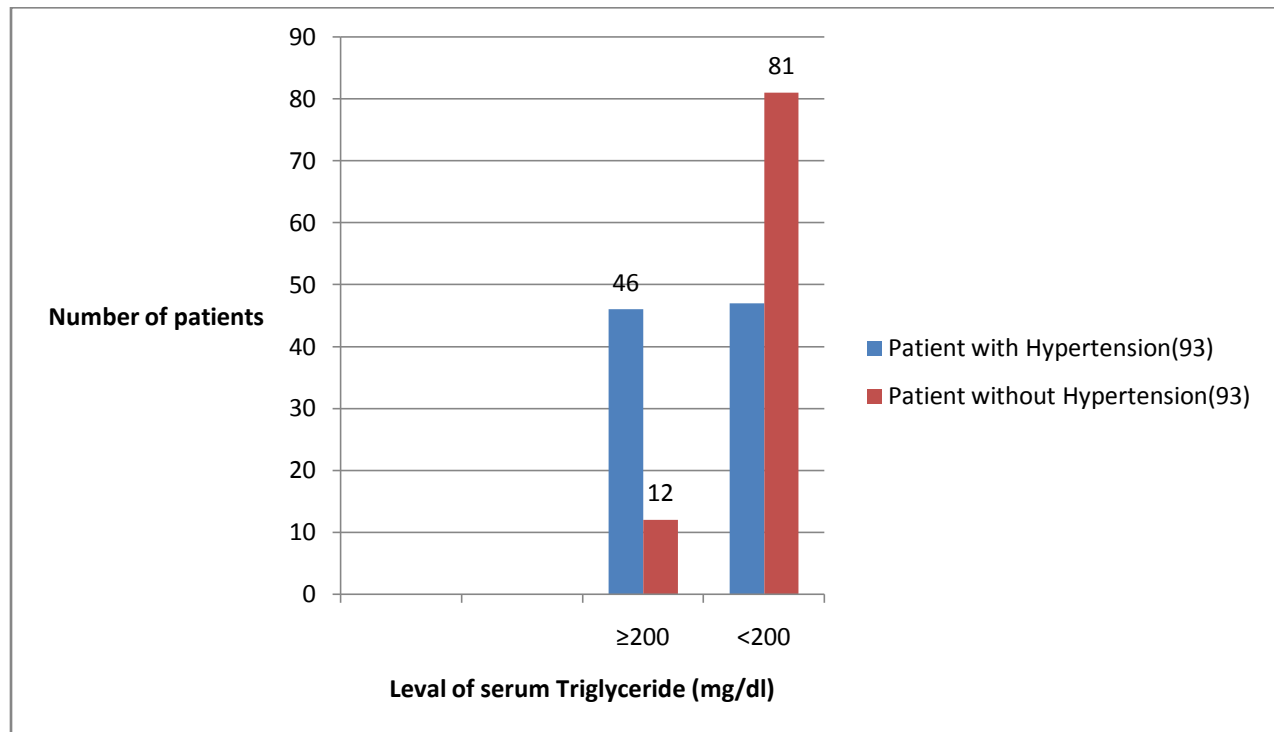


Above table shows comparison of serum total cholesterol among group A and group B. Serum Total cholesterol ≥ 240 mg/dl was observed to be 38.7% in group A and 14 % in group B which is statistically significant. (P value <0.01).

Table 2:- Comparison Of Serum Triglyceride In Both Group :

Serum Triglyceride (mg/dl) ^{8*}	Group-A		Group-B		p value
	No	%	No	%	<0.001
≥ 200	46	49.5	12	13	
<200	47	50.5	81	87	
Total	93	100	93	100	

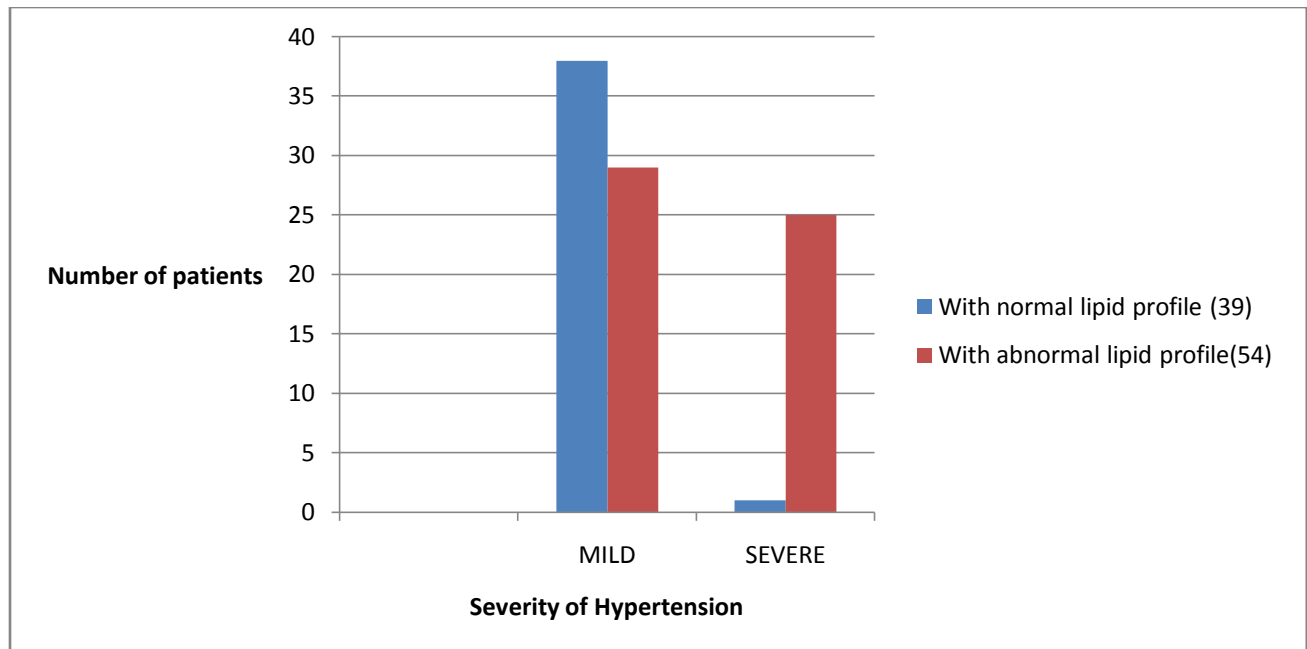
*Lipid values are according to ATP III (Adult treatment plan iii) guidelines⁸



Above table shows comparison of serum total triglyceride among group A and group B. Total serum triglyceride ≥ 200 mg/dl was observed to be 49.5% in group A and 13% in group B which is statistically significant (p value is <0.001).

Table 3:- Comparison Of Severity Of Hypertension With Lipid Profile In Group A:

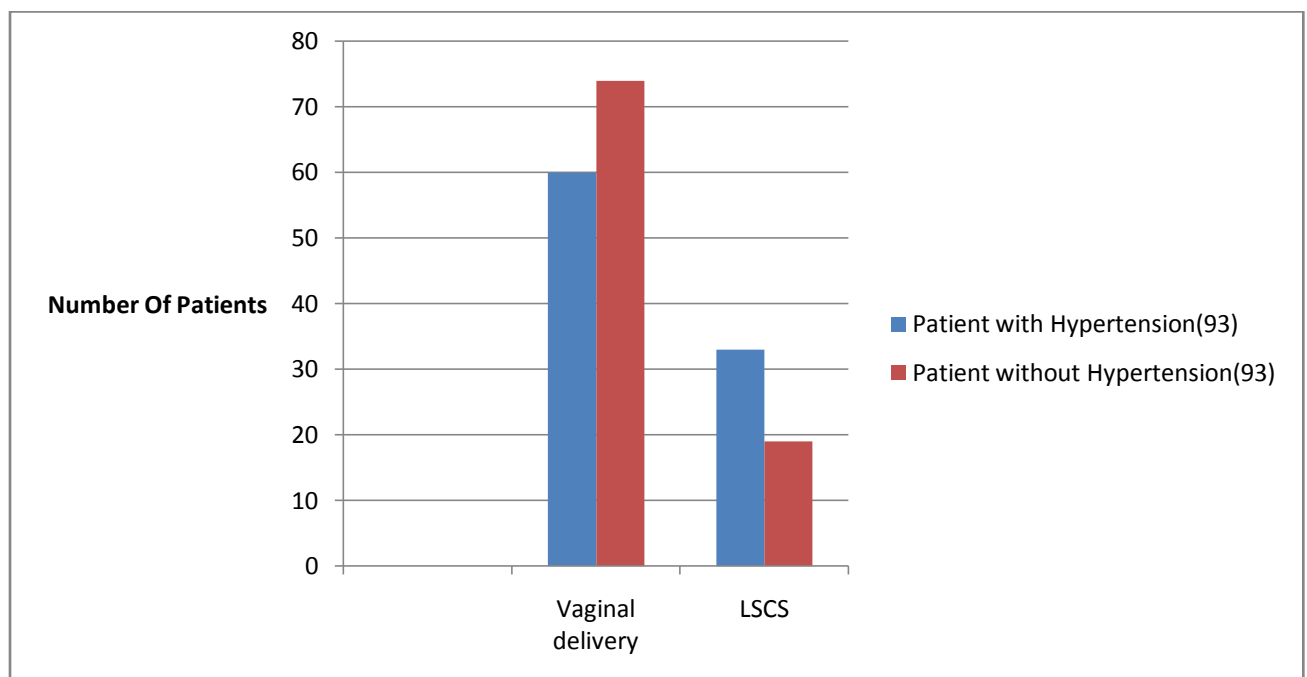
Severity of hypertension	With normal lipid profile (39)		With abnormal lipid profile(54)		P Value
	No.	%	No	%	<0.01
Mild	38	97.5	29	53.8	
Severe	1	2.5	25	46.2	
Total	39	100	54	100	



Above table shows comparison of severity of hypertension with lipid profile in group A. In group A with normal lipid profile 97.5% had mild hypertension, only 2.5% had severe hypertension while in hypertensive with abnormal lipid profile group 53.8% had mild hypertension and 46.2% had severe hypertension which is statistically significant. (p value - <0.01)

Table 4:- Comparison Of Mode Of Delivery:

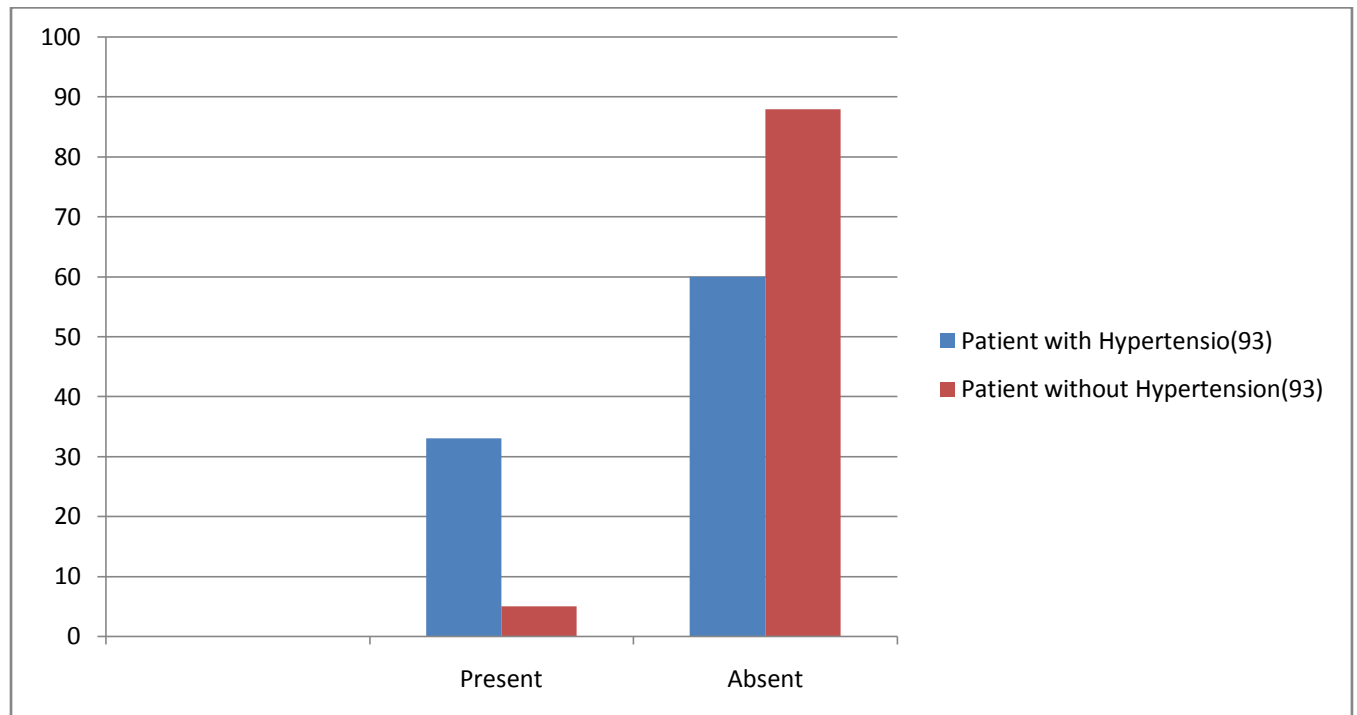
Mode of delivery	Group-A		Group-B		P value
	No	%	No	%	
Vaginal delivery	60	64.52	74	79.57	0.0337
LSCS	33	35.48	19	20.43	
Total	93	100	93	100	



Above table shows mode of delivery in group A- Patient with Hypertension and group B- Patient without Hypertension. In the present study, normal vaginal delivery observed 64.52% in group A and 79.57% in group B. LSCS were observed 35.48% in group A and 20.43% in group B. The rate of LSCS is higher in hypertensive group in comparison with normal delivery which is statistically significant. (P value of 0.03).

Table 5:- Comparison Of Need For Neonatal Resuscitation In Both Group:

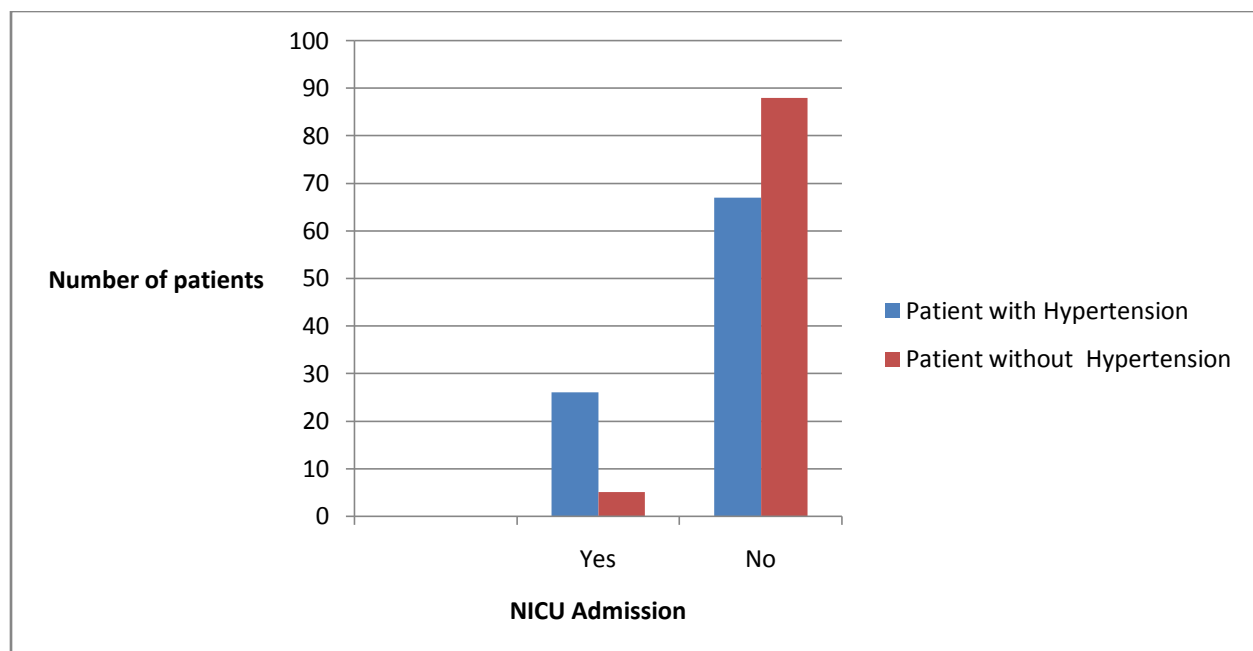
Need for neonatal resuscitation	Group-A		Group-B		P Value
	No.	%	No.	%	
Present	33	35.48	5	5.37	<0.001
Absent	60	64.52	88	94.63	
Total	93	100	93	100	



Above table shows comparison of need for neonatal resuscitation in between group A and group B. In group A- 35.48% babies and in group B -5.37% babies required resuscitative measures more than routine care. The difference was statistically significant (P = <0.001).

Table 6:- Comparison Of Need For Nicu Admission In Both Group :

NICU admission	Group-A		Group-B		P Value
	No.	%	No.	%	
Yes	26	27.95	5	5.37	<0.001
No	67	72.04	88	94.63	



Above table shows comparison of need for NICU admission in between group A and group B. Neonatal Intensive care unit admission was needed by 27.95 % newborns in group A and 5.37% in group B which is statistically significant. (p value of <0.001)

Discussion:-

Table 1:- Comparison Of Serum Total Cholesterol Among Both Group In Various Studies:

Author	Year of study	TC(mg/dl) in HDP	TC (mg/dl) in control	P value
Josephine LP et al ⁹	2012	209.54 ± 32.46	175.16 ± 30.16	<0.0001
Sharami SH et al ¹⁰	2012	238.31 (49.65)	214.32 (42.12)	0.02
Garabet SB et al ¹¹	2013	243.9(18.2)*	212.9 (20.3)	<0.05
Nazli R et al ¹²	2013	216.63±5.17	202.23±4.6	Not significant
Present study	2022	232 ± 52.1	198.3 ± 42.5	<0.01

In the Present series found that mean serum TC(mg/dl) in HDP group was 232 ± 52.1 mg/dl where as it was 198.3 ± 42.5 mg/dl in the control group, which is statistically significant. Thus, it is seen that the level of serum TC are elevated in hypertensive disorders of pregnancy.

Josephine LP et al⁹ investigated that mean serum TC(mg/dl) in HDP group was 209.54 ± 32.46 where as it was 175.16 ± 30.16 in the control group, which is statistically significant.

Sharami SH et al¹⁰ investigated that mean serum TC(mg/dl) in HDP group was 238.31 (49.65) where as it was 214.32 (42.12) in the control group, which is statistically significant.

Garabet SB et al¹¹ investigated that mean serum TC(mg/dl) in HDP group was 243.9(18.2) where as it was 212.9 (20.3) in the control group, which is statistically significant.

Nazli R et al¹² investigated that mean serum TC(mg/dl) in HDP group was 216.63±5.17 where as it was 202.23±4.6 in the control group, which is statistically not significant.

Table 2:- Comparison Of Serum Total Triglyceride Among Both Group In Various Studies:

Author	Year of study	TG (mg/dl) in HDP	TG (mg/dl) in control	P value
Josephine LP et al ⁹	2012	337.24 ± 77.29	197.48 ± 37.95	<0.0001

Nazli R et al ¹⁰	2013	337.71 ±14..34	212.30 ±7.28	0.001
Sharami SH et al ¹¹	2012	340.29 ± 106.45	202.85 ± 63.27	0.001
Garabet SB et al ¹²	2013	281.7 ± 21.3	207.5 ± 21.6	<0.05
Present study	2022	210 ± 69	161 ± 38	<0.01

In present series analyzed that mean serum TG(mg/dl) in HDP group was 210 ± 69 where as it was 161 ± 38 in the control group, which is statistically significant. Hence level of serum TG are elevated in hypertensive disorders of pregnancy.

Josephine LP et al⁹ investigated that mean serum TG(mg/dl) in HDP group was 337.24 ± 77.29 where as it was 197.48 ± 37.95 in the control group, which is statistically significant.

Nazli R et al¹⁰ investigated that mean serum TG(mg/dl) in HDP group was 337.71 ±14..34 where as it was 212.30 ±7.28 in the control group, which is statistically significant.

Sharami SH et al¹¹ investigated that mean serum TG(mg/dl) in HDP group was 340.29 ± 106.45 where as it was 202.85 ± 63.27 in the control group, which is statistically significant.

Garabet SB et al¹² investigated that mean serum TG(mg/dl) in HDP group was 281.7 ± 21.3 where as it was 207.5 ± 21.6 in the control group, which is statistically significant.

Table 3:- Comparison Of Lscs Rate Among Both Group In Various Studies:

Author	Year	LSCS rate in hypertensive group(%)	LSCS rate in normotensive group(%)	P value	
Shivanagappa M et al ¹³	2015	71.1	34.4	0.001	Significant
Bramham K et al ¹⁴	2011	75%	55%	0.001	Significant
Beltagy N et al ¹⁵	2011	65%	30%	0.02	Significant
Present study	2022	35.4%	20.4%	0.03	Significant

In the present series LSCS rate was observed 35.4% in hypertensive group and 20.4% in normotensive group, which is statistically significant (P value of <0.001). Shivanagappa M et al¹³, Bramham k et al¹⁴ and Beltagy N et al¹⁵ found that LSCS rate significantly higher in hypertensive group as compared to normotensive group.

Table 4:- Comparison Of Nicu Admission In Hypertensive Disorder Of Pregnancy in Various Studies:

Author	Year of study	NICU Admission	P Value
		Patient with hypertensive disorder of pregnancy(%)	
Wolde Z et al ¹⁶	2011	22.52%	Significant
Laura A et al ¹⁷	2014	8%	Significant
Lalthantluanga C et al ¹⁸	2015	57%	Significant
Present study	2022	27.95	Significant

In the present series, intensive care unit admission was needed for 27.95 % of newborns in Patient with in hypertensive group and 5.37% in newborns in Patient with normotensive group, which is statistically significant.

Wolde Z et al¹⁶ found that NICU admission in hypertensive group to be 22.52%, which is statistically significant.

Laura A et al¹⁷ found that NICU admission in hypertensive group 8%, which is statistically significant.

Lalthantluanga C et al¹⁸ found that NICU admission in hypertensive group 7%, which is statistically significant.

Conclusion:-

Measurement of lipid levels during hypertensive disorders pregnancy is an important parameter for prediction of adverse perinatal outcome. Abnormal lipid levels in hypertensive disorders of pregnancy are associated with severe hypertension during pregnancy.

Abnormal lipid levels in hypertensive disorders of pregnancy are associated with Low birth weight, Increased incidence of fetal distress, Increased requirement of neonatal resuscitation, Increased NICU admission.

Hypertensive disorders of pregnancy with dyslipidemia are associated with adverse perinatal outcome as compare to hypertensive disorders of pregnancy without dyslipidemia. Dyslipidemia with hypertensive disorders of pregnancy are associated with increased rate of LSCS.

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