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Dyslipidemia in pregnancy and the maternal outcome in Indian scenario

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Abstract
Background: The biological causes of preterm birth remain unknown, despite the decades of research [1, 2]. Metabolic changes, particularly in carbohydrate and lipid metabolism occurs in normal pregnancy to increase circulating glucose and triglycerides to nourish the growing fetus. Fasting plasma glucose is decreased in early pregnancy, and impaired glucose tolerance occurs in late pregnancy due to the Changes in carbohydrate metabolism**.**
Materials and Methods: study was conducted in a private hospital and the births were identified from birth certificate and hospital discharge records over a period of 2 years and were linked approximately 9–12 months prior to delivery through 9–12 months post-delivery. Singleton pregnancy, availability of linked records, gestational age between 20–44 weeks and absence of severe hypertensive diseases including hypertensive heart disease, hypertensive chronic kidney disease and secondary hypertension was included in the study while we excluded those women, who has forms of hypertension which is not the primary focus of our study and could confound the association with the outcome.
Results: The difference between the groups was not statistically significant. (*P*>0.06) 57.56% of participants were primigravidas in which 24.08%) developed pre-eclampsia & 76.92% remained unaffected. 42.44%) of participants were multigravidas in which preeclamptic and normotensives were 7.52% and 92.48% respectively, the difference was statistically significant.
Conclusion: Early prediction of preeclampsia can be used as a tool for the prevention before the development of the disease. So, if there is any test to predict the preeclampsia which can be easily measured and available will be helpful to classify the patient to know the maternal outcome So there is need of further research to discover the specific test to predict the outcomes.

Keywords: Cholesterol, Triglyceride, Preterm Birth, Preeclampsia, Circulating Lipids

Introduction
Delivery prior to 37 weeks of completed gestation is known as Preterm birth. Preterm birth affects approx 11% of pregnancies worldwide, estimated by WHO that represent nearly 15 million births in 2010 [1]. This is the second leading cause of death in children under age 5 [1]. The biological causes of preterm birth remain unknown, despite the decades of research [2]. Metabolic changes, particularly in carbohydrate and lipid metabolism occurs in normal pregnancy to increase circulating glucose and triglycerides to nourish the growing fetus. Fasting plasma glucose is decreased in early pregnancy, and impaired glucose tolerance occurs in late pregnancy due to the Changes in carbohydrate metabolism [3]. Circulating lipids (HDL, LDL) total cholesterol, and triglycerides, increase throughout pregnancy, levels of the triglycerides increases the most among lipid profile [3] but due to the risk of gestational diabetes mellitus much research has been devoted to glucose metabolism during pregnancy [4]. Associations between maternal lipid levels and adverse pregnancy outcomes, including preterm birth increases the interest in lipid levels during pregnancy. Many investigators have been investigated associations between maternal lipid levels during pregnancy, although the lipid components and magnitude of associations have been inconsistent across studies [5-14].
One study has investigated the association between dyslipidemia, which is defined by lipid levels in prenatal screening, and it was found to be associated with the increased risks for preterm birth with mid-trimester hyperlipidemia [8]. So we decided to conduct a study to investigates the clinical diagnosis of maternal dyslipidemia and its subsequent outcomes.

Materials and methods
The present study was conducted in a private hospital and the births were identified from birth certificate and hospital discharge records over a period of 2 years and were linked approximately 9–12 months prior to delivery through 9–12 months post-delivery.

Singleton pregnancy, availability of linked records, gestational age between 20-44 weeks and absence of severe hypertensive diseases including hypertensive heart disease, hypertensive chronic kidney disease and secondary hypertension was included in the study while we excluded those women, who has forms of hypertension which is not the primary focus of our study and could confound the association with the outcome. We were restricted our dyslipidemia to only those that occurred on a hospital admission at or prior to the delivery date. Methods and protocols were approved by the Committee for the Protection of Humans. A total of 120 patients were included in study after sample size calculation at 95% confidence level & 80% study power, considering 11 independent variables for the prediction of outcome. Data were analysed by using Statistical Analysis Software (SAS) version 9.4

Results

100 subjects remained in the study for analysis as 20 patients did not come for the follow up. The maximum number of participants from preeclampsia group and control group was between 26-30 years. The difference between the groups was not statistically significant. (p>0.06) (Table 1). 57.56% of participants were primigravidas in which 24.08%) developed pre-eclampsia & 76.92% remained unaffected. 42.44%) of participants were multigravidas in which preeclamptic and normotensives were 7.52% and 92.48% respectively, the difference was statistically significant (Table 2). 62.11% participants developed pre eclampsia & 5.45% unaffected participants delivered at <37 weeks of gestation while 92.55% of participants remained unaffected & 37.89% of participants developed pre eclampsia delivered at >37 weeks of gestational age. The difference is statistically highly significant (P<0.05) (Table 3). Out of total pre eclamptic patients 45.44% were delivered by LSCS as compared to 12.98% unaffected participants. This difference was statistically significant. (p <0.05) (Table 4). Total cholesterol was deranged in 24.42% participants, in which 39.46% developed preeclampsia and 62.54% remained normotensive, difference was statistically significant (p=0.001) (Table 5) HDL was deranged in 27.13% participants, in which 32.03% developed preeclampsia and 69.97% were remained normotensive. This difference was statistically significant. (p<0.05) (Table 6). LDL was deranged in 27.83% participants, in which 33.38% developed preeclampsia and 66.63% remained normotensive, the difference was statistically significant (p=0.003) (Table 7). VLDL was deranged in 36.14% participants, in which 27.21% developed preeclampsia and 72.79% remained normotensive. This difference was statistically significant. (p<0.05) (Table 8). TGs were deranged in 36.14% participants, in which 29.21% developed preeclampsia and 72.79% remained normotensive. On application of statistical tests the difference was statistically significant (p=0.024). (Table 9). Mean level of TG in participants developed preeclampsia 183.48±35.63mg/dl was significantly higher as compared to normotensive group 158.09±28.10 (p<0.001) (Table 10).

Table 1: Distribution of Study Participants According to Age

Age (Years)	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
21-25	40	88.13	6	11.87	47	42.44
26-30	43	78.78	11	2.1.22	52	46.65
>30	11	91.91	2	10.09	13	11.91

Table 2: Distribution of Study Participants w.r.t. Gravidity

Gravida	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Primi	49	76.92	16	24.08	63	57.56
Multi	44	92.48	4	7.52	47	42.44

Table 3: comparison between groups according to gestational age at delivery

GA at delivery						
Groups	Preterm		Term			
	No.	%	No.	%	No.	%
Pre-eclampsia	12	62 .11	8	37.89	19	100
Normotensive	5	5.45	86	92.55	92	100

Table 4: Distribution of Study Participants According to Mode of Delivery

Mode of delivery						
Groups	LSCS		Vaginal delivery			
	No.	%	No.	%	No.	%
Pre-eclampsia	7	45.44	11	56.56	19	100
Normotensive	12	12.98	79	85.02	92	100

Table 5: association of total cholesterol with preeclampsia

TC	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Normal	76	89.59	9	10.41	86	77.58
Deranged	17	62. 54	11	39.46	27	24.42

Table 6: Association of HDL with Preeclampsia

HDL	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Normal	72	88.02	10	11.98	81	72.87
Deranged	21	69.97	10	32.03	30	27.13

Table 7: Association of LDL with Preeclampsia

LDL	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Normal	71	90.14	8	9.86	78	70.17
Deranged	22	66.63	10	33.38	33	27.83

Table 8: Association of VLDL with Preeclampsia

VLDL	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Normal	66	91.28	8	10.72	71	65.86
Deranged	29	72.79	10	27.21	40	36.14

Table 9: Association of Triglycerides with Preeclampsia

TGs	Normotensive		Pre-eclampsia		Total	
	No.	%	No.	%	No.	%
Normal	66	91.28	8	10.72	71	63.86
Deranged	29	72.79	12	29.21	40	36.14

Table 10: Lipid Profile Levels of Preeclamptic and Normotensive Women

Lipid Profile	Normotensive	Preeclampsia	P value
TC	181.77±36.58	222.36±43.68	<0.001
HDL	44.62±7.35	38.69±7.50	0.035
LDL	111.14±25.14	131.87±24.74	0.002
VLDL	33.10±6.64	37.71±8.10	0.002
TG	158.09±26.10	183.48±35.53	<0.001

Discussion

The results of our study are almost like those by Despande H *et al.* [15]; conducted comparative observational study on

60 pregnant women with objective to investigate the lipid profile in normotensive & preeclamptic patients and to assess abnormal lipid profile in relevance severity of hypertension, maternal outcome & perinatal outcome. it absolutely was seen that mean Cholesterol level in PIH cases was 208.8±12.64mg/dl and in normal cases was 163.8±8.83mg/ dl, mean HDL level in PIH cases was 38.06±3.01mg/dl and in normal cases was 49.56±4.08mg/dl, mean LDL level in PIH cases was 140.36±10.8 mg/dl and in normal cases was 120.2±7.98mg/dl, mean VLDL level in PIH cases was 52.76±4.96mg/dl and in normal cases was 35.4±3.62mg/dl and mean Triglyceride level in PIH cases was 201.06±10.67mg/dl and in normal cases was 158.8±9.96mg/dl. The association of Mean cholesterol, HDL, LDL, VLDL and Triglyceride level among normal and PHT cases are statistically significant. (p<0.05).They concluded that the association between dyslipidemia and risk of preeclampsia is biologically plausible and is compatible with what's known about pathophysiology of preeclampsia. Vani I *et al.* [16] conducted an open labeled clinical study to check the lipid profile in normotensive and hypertensive pregnant women. The study included two groups-50 normotensive and 50 preeclamptic pregnant women in whom fasting blood samples were sent for estimation of serum lipid profile during their trimester. There was a major increase (p<0.5) in total cholesterol, LDL cholesterol, VLDL cholesterol and triglycerides in preeclamptic group compared to normotensive group. There was a major decrease in cholesterol in preeclamptic group compared to normotensive group. This study in correlation with various other studies concluded that dyslipidemia plays a vital role within the pathogenesis of preeclampsia. Khaliq F *et al.* [17] performed a cross sectional study to see serum lipid and lipoprotein cholesterol in pre-eclamptic women in their trimester, taking normal pregnant women in trimester as controls. The values were compared in patients of various parity. it absolutely was observed that serum triglycerides (TG), cholesterol (ChoD, LDL-c, VLDL-c, phospholipids (PL) and total lipids (TL) were significantly raised, while HDL-c, was significantly lower in preeclampsia compared to normal pregnancy. TG and VLDL-c were found to be increased significantly with parity. Iftikhar U *et al.* [18] conducted a comparative cross-sectional study to assess the relation between serum leptin levels and lipid profile in women with pre-eclampsia and to guage their atherogenic role within the pathophysiology of pre-eclampsia. They found that each one the variables of the lipid profile of pre-eclamptic patients, were found to be significantly elevated as compared to controls. The whole lipid profile was also compared to the severity of pre-eclampsia and total cholestrol was found to be significantly raised (p<0.01) in severe pre-eclampsia in comparison to mild. On correlating serum leptin with lipid profile, again total cholestrol was found to be significantly high (p<0.05) in pre-eclamptic group compared to controls. This study concluded that serum leptin levels during pre-eclampsia are strongly related to total cholesterol whereas association with other variables is insignificant. With severity of pre-eclampsia when leptin level rises, total cholesterol also rises. These changes is also the results of oxidative stress and will contribute to atherogenesis and pathogenesis of pre-eclampsia. Gohil *et al.* [19] conducted study to guage lipid profiles in subjects with preeclampsia and to see if there's any change in lipid profiles in subject of preeclampsia as compared to normal antenatal females, non-pregnant females and postpartum females. They found that Dyslipidemia within the variety of significantly decreased HDL concentration and significantly increased total cholesterol, LDL, VLDL & Triglycerides concentration is conspicuously evident in subjects of preeclampsia as compared to non-pregnant, normotensive pregnant and postpartum subjects & concluded that Dyslipidemia is significantly evident in preeclampsia and plays a vital pathological role. Saha D et al.[20] conducted a case-control study to guage the association of lipid profile in pre- eclampsia mother as compared to no pregnant woman and normotensive pregnant mother. They evaluated 180patients of which 60 were non-pregnant normotensive, 60 were pregnant normotensive and 60 were pre-eclamptic mother. Serum lipid profile of all patients were monitored. They found in preeclampsia there's significant decrease of High density lipoprotein (HDL) and significantly increase of tenuity lipoprotein (LDL), Very tenuity lipoprotein (VLDL) and Triglycerides concentration seen compared to non-pregnant normotensive and pregnant normotensive subjects. They concluded that lipid metabolism plays a key role within the pathophysiology of Pre-eclampsia and Eclampsia.

Conclusion

Early prediction of preeclampsia can be used as a tool for the prevention before the development of the disease. So, if there is any test to predict the preeclampsia which can be easily measured and available will be helpful to classify the patient to know the maternal outcome So there is need of further research to discover the specific test to predict the outcomes.

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