

Original Research Article

Cord lipid profile comparison of newborns of hypertensive mothers

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Received: 16 December 2019

Revised: 13 March 2020

Accepted: 20 March 2020

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ABSTRACT

Background: To compare the cord blood lipid profile of 100 newborn babies born to hypertensive (Group A) and normotensive mothers (Group B).

Methods: Total 100 newborns were taken, 50 born to hypertensive mothers and 50 to normotensive mothers. 5ml umbilical venous blood was collected, after clamping the cord, from placental side of the cord and sent to laboratory for centrifugation. Serum was analysed for lipid profile by spectrophotometry by siemens dimensional Rxl- Total Cholesterol, Triglycerides, High density lipoprotein and Low density lipoprotein and Very low density lipoprotein. Comparison of the cord blood lipid levels in both the groups was done.

Results: Cord blood lipid profile was deranged in newborns of hypertensive mothers with Cord TC, TG and LDL being statistically significantly higher than the mean reference value and 95th centile. Cord blood of term newborns of hypertensive mothers had Cord TC TG and LDL being statistically higher whereas only Cord TC being statistically higher in preterm neonates of hypertensive mothers.

Conclusions: Cord blood lipid levels were significantly deranged in newborns of hypertensive mothers. This helps us in providing the target population at risk and cord blood lipid profile of newborn serving as an indirect guide for lifestyle modifications and helping in early intervention and prevention of future coronary heart disease.

Keywords: Atherosclerosis, Cord lipid profile, Hypertensive mother, Newborn screening

INTRODUCTION

Atherosclerosis is a major risk factor for coronary artery disease and consequent morbidity and mortality in adult life. The fetal programming and the 'fetal origins hypothesis' emphasize the profound and sustained impact of factors related to the fetal health including atherosclerosis on the process of chronic diseases in adulthood.^{1,2}

Given the understanding that fetal lipid profile will show deranged results either due to genetic programming or due to prepartum and/or intrapartum stress, and that this deranged lipid profile can continue into adult life, it is wise to recognize such children at risk in the antenatal

and postnatal period itself and give special attention to them in terms of life style modification to prevent development of future complications; particularly cardiovascular complications.³

In PE there is placental dysfunction leading to maternal endothelial dysfunction.⁴ This maternal endothelial dysfunction contributes to the oxidative stress, dyslipidaemia and the inflammatory process in maternal circulation which is reflected in fetal circulation. Cord blood would be a feasible and simple method for detecting cholesterol level at birth. Neonatal lipids level could serve as a guide to know the physiological levels of lipids required for maintaining the normal bodily mechanisms.⁵

METHODS

This is a case control study, conducted in the Department of Paediatrics, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab.

Inclusion criteria

Total 100 newborns were taken, 50 born to hypertensive mothers and 50 to normotensive mothers, 5ml umbilical venous blood was collected, after clamping the cord, from placental side of the cord and sent to laboratory for centrifugation. Serum was analysed for lipid profile by spectrophotometry by siemens dimensional Rx1- Total Cholesterol, Triglycerides, High density lipoprotein and Low density lipoprotein and Very low density lipoprotein. Comparison of the cord blood lipid levels in both the groups was done.

Exclusion criteria

Neonate with one minute APGAR score of less than 7, Out born neonates, Neonates with congenital anomalies, Neonate born to mothers with: Pre-existent medical illness/ complications including diabetes mellitus, thyroid disorders, cardiovascular diseases and HIV, Family history of cardiovascular diseases; particularly coronary artery disease, born via instrumental delivery (forceps or vacuum).

RESULTS

As shown in table 1, 51% of mothers in our study had serum total cholesterol >240mg/dl. Out of this, 43 (86%) of hypertensive and only 8 (16%) of normotensive had >240mg/dl. Total cholesterol of 200-240mg/dl was in 8% of hypertensive and 40% of normotensive mothers. Total cholesterol <200mg/dl was in 6% of hypertensive and 44% of normotensive group. It was observed that hypertensive mothers had higher levels of total cholesterol compared to normotensive group and was statistically highly significant (p-value -0.000).

Table 1: Maternal serum total cholesterol levels in both groups.

Total cholesterol (mg/dl)	Hypertensive mothers	Normotensive mothers	Total
<200	3 (6%)	22 (44%)	25
200-239	4 (8%)	20 (40%)	24
>240	43 (86%)	8 (16%)	51
Total	50	50	100

Table 2 shows 33% mothers in our study had triglyceride levels between 200-499 mg/dl, 37% in 150-199 mg/dl and 30% <150mg/dl. Out of 50 hypertensive females, 30 (60%) had between 200-499mg/dl, 16 (32%) between 150-199mg/dl and 4 (8%) <150mg/dl. Normotensive

group had most values <150 mg/dl. It was observed that the triglyceride levels were deranged in hypertensive females as compared to normotensive group and was statistically highly significant factor (p value-0.000).

Table 2: Maternal serum triglycerides in both groups.

Triglyceride level (mg/dl)	Hypertensive mothers	Normotensive mothers	Total
<150	4 (8%)	26 (52%)	30
150-199	16 (32%)	21 (42%)	37
200-499	30 (60%)	3 (6%)	33
			100

In table 3, 37 % females had high density lipoprotein levels <40mg/dl, 51% had between 41-59mg/dl and 12% had >60mg/dl. 46% of hypertensive and 28% of normotensive had levels <40mg/dl and it was observed that high density lipoprotein levels were lower in hypertensive group and was statistically significant (p-value 0.008).

Table 3: Relation of maternal serum high density lipoprotein.

High density lipoprotein levels (mg/dl)	Hypertensive mothers	Normotensive mothers	Total
>60	9 (18%)	3 (6%)	12
41-59	18 (36%)	33 (66%)	51
<40	23 (46%)	14 (28%)	37
	50	50	100

p-value -0.008, highly significant

Table 4: Maternal low density lipoprotein levels in both groups.

Low density lipoprotein levels (mg/dl)	Hypertensive mothers	Normotensive mothers	Total
Less than 129	27 (54%)	41 (82%)	68
130-159	4 (8%)	2 (4%)	6
More than 160	19 (38%)	7 (14%)	26
			100

p-value- 0.021, highly significant

Table 4 shows that, serum low density lipoprotein levels > 160mg/dl were seen in 26 % of the total mothers. 54% of hypertensive females had <129mg/dl and 38% had >160mg/dl. In the normotensive group, 82% had <129mg/dl and 14% had >160mg/dl. It was observed that the low density lipoprotein levels were higher in

hypertensive group (p-value- 0.021, statistically significant).

Table 5: Comparison of cord blood lipid profile of newborns.

Cholesterol (mg/dl)	Nelson values (mean / 95 th centile)	Hypertensive mothers	Normotensive mothers	p-value
Total cholesterol	68/103	127.38±34.05	57.57±16.17	0.000/0.000
Triglycerides	34/84	55.57±41.14	24.45±14.30	0.000/0.000
HDL-C	35/60	31.34±15.34	29.10±11.72	0.106/0.558
LDL-C	29/50	39.09±13.82	26.93±11.72	0.000/0.001

Table 5 shows the values of cord blood cholesterol in newborns. Cord total cholesterol more than mean value was observed in 59% of total newborns. In the hypertensive group, 86% had higher mean cord total cholesterol and was statistically highly significant factor (p-value-0.000). Cord total cholesterol more than 95th centile was in 36% of total newborns. 72% of hypertensive newborns had more than 95th centile and was statistically highly significant (p-value -0.000). It was observed that cord blood total cholesterol levels were deranged in hypertensive group.

As shown in table 5, Cord triglyceride levels more than mean value was observed in 39% of total newborns. In the hypertensive group, 60% had higher mean cord triglyceride and was statistically highly significant factor (p-value-0.000). Mean Cord triglyceride more than 95th centile was in 15% of total newborns. 30% of hypertensive newborns had more than 95th centile and was statistically highly significant (p-value -0.000). It was observed that cord triglyceride levels were deranged in hypertensive group.

While comparing the cord high density lipoprotein levels in our study (table 5), mean high density lipoprotein value was taken as 35 mg/dl and 95th centile was taken as 60mg/dl. It was observed that 25% of newborns had cord high density lipoprotein above mean and 3% newborns had more than 95th centile. It was observed that neonates having cord high density lipoprotein more than mean were 18% and more than 95th centile 2% in normotensive group and 32% and 4% respectively in hypertensive. Higher cord high density lipoprotein was in hypertensive group with respect to both mean value and 95th centile but the results were not statistically significant (p-value-0.106 and 0.558 respectively).

Table 5 shows that mean cord LDL and cord LDL (95th) were 30mg/dl and 50mg/dl respectively. While comparing the values in both the groups, we observed 54 % of total neonates had cord LDL >30 mg/dl and 10% had >50 mg/dl. In normotensive group, no. of neonates having higher mean cord LDL were 18% and none had cord LDL >95th centile. Whereas in hypertensive group, 36% had higher than mean cord LDL and 10% had >95th. It was observed that higher cord LDL was seen in

hypertensive group and was statistically significant factor (p-value-0.001).

DISCUSSION

In the present study, a total sample of 100 neonates was taken. They were divided into two groups: Group A (Cases) comprising of 50 neonates born to hypertensive mothers and Group B (Control) comprising of 50 neonates born to normotensive mothers. Main findings in our study were the variations in the cord lipid values in both the groups as compared to reference mean and reference 95th centiles.

In our study, maternal lipid profile was compared in both the groups. Higher levels of serum TC, TG, LDL and HDL was observed in hypertensive mothers. Belo et al concluded that higher TG and lower HDL in preeclampsia females compared to normal and concluded that atherogenic lipid profile is enhanced in preeclampsia.⁵ Winkler et al, and Lima VY et al, in their study had higher TG in preeclamptic females.^{6,7} Ophir E et al found maternal LDL and TG were significantly higher while HDL was significantly lower in preeclamptic females.⁸

Anuradha R, Durga T et al, had TC, TG and LDL were increased in hypertensive mothers when compared to normal pregnancy.⁹ Yadav S et al, in their comparative study on 200 pregnant females concluded significant increase in TC, TG and LDL and significant decrease in HDL in preeclampsia females.¹⁰ Shridhara S.K. study had TG and LDL higher in preeclampsia group.¹¹ Deranged lipid profile of mothers doesn't correlate with cord lipid profile.

The mean values of cord TC, TG and LDL and HDL were in hypertensive group and in normotensive group. Cord TC, TG and LDL were more than mean reference value while cord HDL was lower in hypertensive group. Comparing hypertensive group with reference 95th centile, the values of cord TC was higher in hypertensive group. Cord TC, TG, HDL and LDL were lower in normotensive group compared to reference values (mean and 95th centile) and hypertensive group. Concluding that the newborns born to hypertensive mothers had

higher cord lipid levels than the mean reference values and 95th centiles.

Similar to this study, Rodie et al, reported that TG and TC were higher in umbilical cord blood from preeclamptic pregnant women, suggesting the upregulation of placental transport mechanisms.¹² It also concluded that there were no correlations between maternal and fetal lipid levels, or between fetal birth weight and either maternal or fetal lipids in the PE which was in contrast to our study. Ophir et al, had higher LDL levels and lower birth weight of newborns of hypertensive mothers, concluding that cardiovascular risk in newborns of preeclamptic mothers may begin in utero.⁸

Study by Catarino showed significant differences for umbilical cord blood TG and TC with higher values in the preeclamptic group, similar to our study. Cord HDL was significantly lower in preeclamptic group when compared to normal group. Levels of cord LDL was similar in both groups which was in contrast to our study. Sudharshana murthy KA found higher cord TC, TG, LDL and lower cord HDL in neonates of hypertensive mothers similar to study.¹³ Cord LDL was significantly higher in newborns of hypertensive mothers while rest were not significantly associated.¹³

In a metanalysis done on various studies by Prabha H, cord values of TC, TG, LDL and HDL were compared.¹⁴ It concluded that LDL and TG was higher in umbilical cord blood of newborns of preeclamptic mothers similar to our study but in contrast, it said that cord HDL was lower and no difference was seen in cord TC levels in both the groups. These results justify the influence of oxidative stress in preeclamptic mothers on cord lipid levels.

CONCLUSION

Neonatal lipid levels serve a guide to know the cord lipid levels required for maintaining bodily metabolisms. The present study helps us in providing the target population at risk and serving as an indirect guide for lifestyle modifications and use of adult lipid lowering therapy in prevention of future coronary heart disease. To conclude that the present study, though small shows promising results that hypertensive status of mother could impact neonatal lipid profile; however, larger prospective studies are required to validate these results.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kaur K, Thapar K, Malhotra P. Cord lipid profile comparison of newborns of hypertensive mothers. *Int J Contemp Pediatr* 2020;7:1038-42.