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Original Research Article

A PROSPECTIVE STUDY ON SERUM LIPID PROFILE IN PRETERM AND TERM APPROPRIATE FOR GESTATIONAL AGE INDIAN NEWBORNS

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Abstract

Cord blood lipid profile in neonates helps to screen for neonatal dyslipidaemia which is associated with long term morbidity mainly cardiovascular disease.

Materials and Methods: The present study done in Dept. of Paediatrics, Mahadevappa Rampure Medical College, klb with 222 term and pre-term small or appropriate for gestational age (AGA) neonates using cord blood lipid profile.

Results: In the present study of above mentioned 222 neonates, preterm accounts for 30.1% and term neonates accounts for 69.9%. AGA was 63.1% and SGA was 36.9%. Term AGA was 38.2%, term SGA 31.5%, preterm AGA was 24%, preterm SGA was 5.4%.

Conclusions: Preterm AGA had higher cord lipid profile values compared to the term AGA neonates. Preterm SGA neonates had lower cord lipid profile of HDL, and LDL as compared to preterm AGA neonates. SGA neonates had higher total cholesterol, triglycerides and VLDL compared to AGA neonates. SGA neonates had lower LDL and HDL as compared to AGA neonates.

Keywords: Cord blood lipid profile, Preterm, Term, AGA, Small for gestational age

INTRODUCTION

The increasing morbidity and mortality due to coronary heart diseases among male and female in early middle age is a major cause for concern in most industrialized countries. Coronary heart diseases appear as a significant cause of death after 40 years of age. The incidence of coronary artery disease depends on the prevalence of genetic and environmental risk factors. There is a concept known as "fetal origin of cardiovascular disease hypothesis" which suggests that an adverse intrauterine environment during a critical period of development could program or imprint the development of fetal tissues and organs, and permanently determine responses that produce later dysfunction and disease. Thus, the arterial hypertension of adults, dyslipidaemia, type 2 diabetes, for all these, diseases process start during fetal life and are associated with fetal growth restriction and low birth weight.[1]

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Lipid profile is a marker of an underlying cardiovascular status. Lipid profile includes measurement of cholesterol and its derivatives and various atherogenic indices. Studies have shown that SGA babies had abnormal lipid profile compared to AGA babies.[2]

There are many studies showing the direct relationship between the abnormalities in lipid profile among the SGA babies and occurrence of cardiovascular diseases. The present study was undertaken for early detection of abnormalities in the lipid profile at the earliest (at birth), especially in preterm and SGA babies, so that these high- risk babies can be under vigilant monitoring in future. Early diagnosis followed by prudent dietary supplementation and drug therapy in these high risk neonates may provide an opportunity for long range primary melioration of risk factors that contribute to development of cardio vascular diseases in adult life.[3]

Materials and Methods

The present study done in Dept.of Paediatrics, Mahadevappa Rampure Medical College, klb with 222 term and pre-term small or appropriate for gestational age (AGA) neonates using cord blood lipid profile.

Inclusion criteria

Term and preterm who are SGA or AGA neonates who are delivered in Dept. of Paediatrics, Mahadevappa Rampure Medical College were included

Exclusion criteria

Neonates with any Congenital malformations, large gestational age and post term neonates were excluded from the study. The subjects are included after obtaining written informed consent from parents/ guardian. Babies are classified as AGA and SGA with the help of AIIMS intrauterine growth charts.

Any baby whose weight less than the 10^{th} percentile for the respective age is classified as SGA and neonates who between 10^{th} and 90^{th} percentiles are classified as AGA.

Statistical analysis

Results were expressed as mean ± standard deviation for continuous variables and as number and proportion (%) for categorical data. Since all data are known to be normally distributed, the parametric tests were used for statistical analyses.

Differences between SGA, AGA neonates and preterm, term neonates as well as between male and female neonates were determined by student's T test. Chi-square test was applied to test the association between two categorical factors. All the tests of significance were applied at 5% level of significance

RESULTS

The study was conducted over a period of 1 year from 2022 to 2023, involving 222 neonates, comprising 155 term, 67 preterm, and 6 post-term neonates in NICU of department of paediatrics,

Gestational age distribution

In the total 222 neonates included in the study, 67 were preterm neonates and 165 were term neonates.

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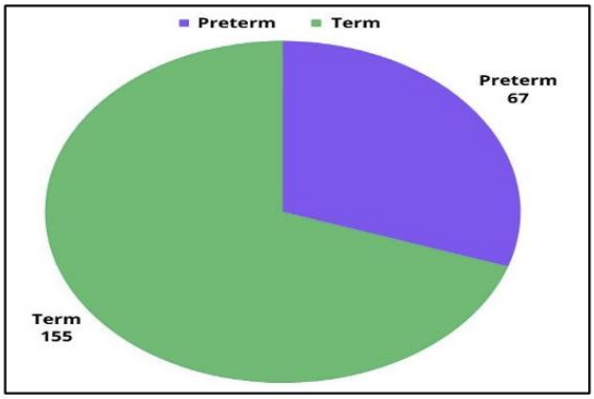

Figure 1: Gestational age distribution.

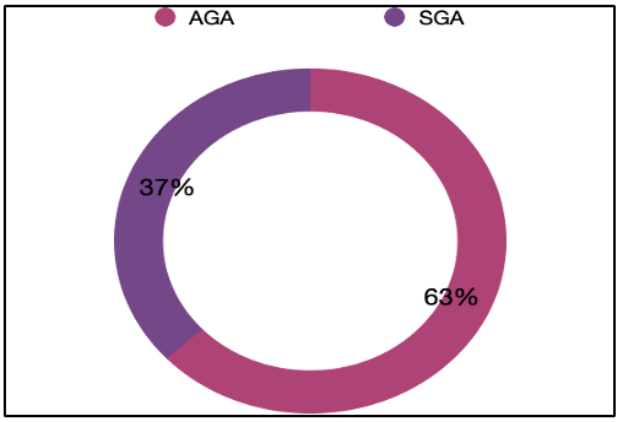

Figure 2: Birth weight distribution

Birth weight distribution

In the study population, 37 percent were AGA neonatal babies and 63 percent were small for gestational age (SGA) neonatal babies.

Gender distribution

There are 43 percent males and 57 percent females were included in the study.

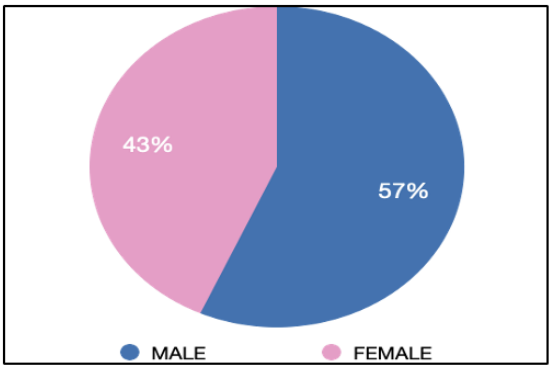

Figure 3: Gender distribution.

Gestational age and birth weight distribution

In the study, 38.2 percent were Term AGA, 31.5 percent were term SGA, 24% percent were pre term AGA and 5.4 percent Pre term SGA

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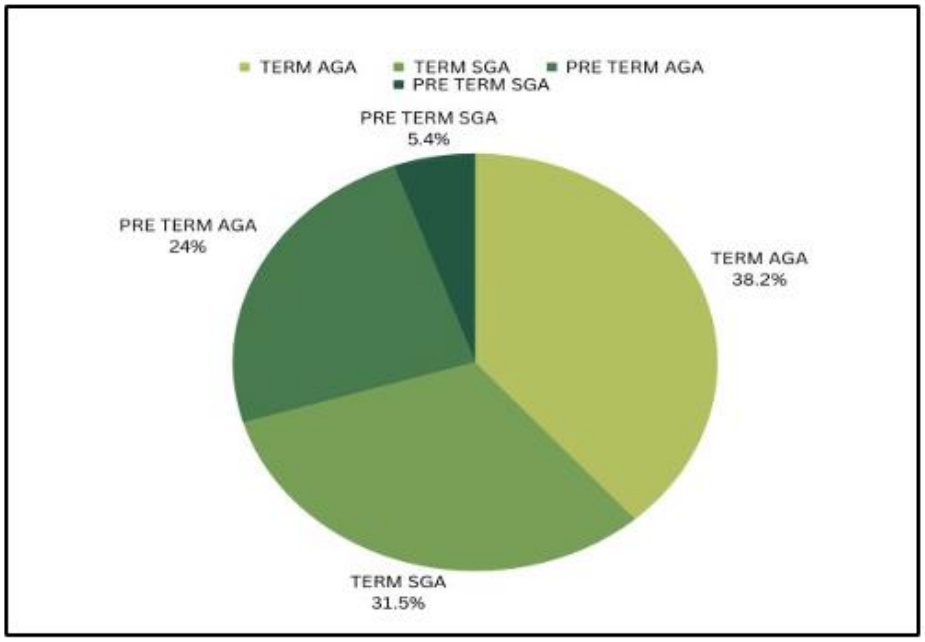

Figure 4: Gestational age and birth weight distribution.

Table 1: Gestational age distribution according to weeks.

GA (in weeks)	Term	Percent (%)	Pre-term	Percent (%)
<34	0	0	34	15.3
34-37	0	0	33	14.8
37-42	155	69.8	0	0

Term neonates with gestational age more than 37 weeks were around 69.8 percent and pre term neonates with 34- 37 weeks gestational age were around 14.8 percent and Pre term neonates with gestational age less than 34 weeks were around 15.3 percent.

Table 2: Comparison of mean values and standard deviation of cord lipid profile among term AGA and preterm AGA neonates.

Lipid profile	TC	TG	HDL	LDL	VLDL
Term AGA	71.70±21.25	66.28±19.95	27.95±5.34	34.26±16.05	13.24±03.98
PT AGA	105.82±27.21	77.50±24.69	41.32±9.49	60.10±24.01	15.50±04.53
P value	<0.001	<0.05	<0.001	<0.001	<0.01

Table 3: Comparison of mean values and standard deviation of cord lipid profile among term SGA and preterm SGA neonates.

Lipid profile	TC	TG	HDL	LDL	VLDL
Term SGA	101.11±27.03	81.95±22.70	29.02±07.90	45.64±08.48	16.39±04.54
PT SGA	92.00±24.40	84.00±17.81	27.80±07.39	48.45±21.26	16.80±03.56
P Value	0.1176	0.6545	0.4763	0.4456	0.6545

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Table 4: Comparison of mean values and standard deviation of cord lipid profile according to gain in weeks.

Lipid profile	Gestational age (in weeks)				P value
	<34	34-37	37-40	40	
TC	123.41±25.15	92.03±23.03	82.97±27.18	83.50±09.57	<0.001
TG	100.58±14.86	75.39±20.07	71.27±22.17	86.75±14.03	<0.001
HDL	40.11±05.66	33.06±11.44	29.50±06.35	36.75±05.85	<0.001
LDL	67.52±25.99	50.69±29.33	38.91±50.02	42.75±05.82	<0.001
VLDL	20.11±02.97	15.07±04.01	14.27±04.43	17.35±02.80	<0.001
AI	3.11±0.71	3.07±1.15	3.04±1.29	2.29±0.18	0.643

DISCUSSION

The aim of this study was to investigate variations in cord blood lipid profiles between preterm and term neonates, as well as SGA and AGA neonates. Following written informed consent, relevant maternal data was collected. Cord blood was obtained immediately after delivery, allowed to clot for serum separation, and sent to lab for analysis. Neonates were categorized as term or preterm using the new Ballard score, and as SGA/AGA using AIIMS intrauterine growth charts, with further classification into symmetrical/asymmetrical intrauterine growth restriction (IUGR) based on the Ponderal index. Kelishadi et al and Pardo et al in their study concluded similar result in terms of decrease of cord blood HDL levels which was also found in the present study.[4,5] Daniel et al, Wang et al and Hossain et al in their studies had similar results.[7-9]In the present study cord blood lipid profile values in SGA were elevated when compared to AGA, the reason is that, there is lack of glucose as fuel in SGA babies, so these babies use alternative source as a fuel (amino acid and lipids) and generate glucose (gluconeogenesis), where by activating lipid and other metabolism, so there will be increased hepatic generation of lipids (particularly VLDL and chylomicrons) also, there is decreased peripheral utilization of lipids because of decreased activity of lipoprotein lipase enzyme in growth restricted babies, these two facts explain higher concentration of plasma lipids in SGA babies.[5,8]

Barker hypothesis demonstrated that low birth weight correlated with an increased prevalence of cardiovascular disease, hypertension and type 2 diabetes mellitus and suggested that this association reflects the phenomenon known as programming, whereby a stimulation or insult during a critical period of intrauterine life could also result in alterations of physiology and metabolism during adult life.[11,12]

In the present study term SGA had higher cord blood lipid profile values compared to the term AGA. Oba et al in their study they concluded that preterm SGA had higher values of TC, TG, LDL, HDL compared to preterm AGA which was statistically significant with p<0.0001, <0.01, <0.0001, <0.0001 respectively and term SGA had higher values of TC, TG, LDL, HDL compared to term AGA which was statistically significant with p<0.0001, <0.01, <0.0001, <0.0001 respectively.[10]

In the present study the average birth weight of SGA was1.77±0.35, and it was statistically significant with p<0.001. Similarly Study conducted by Pardo et al and Jones et al found the birth weight to be 2.04±0.76 and 2.07±0.53 respectively, which was also statistically significant with a p value of p<0.01.[5,6] But in studies done by Kelishadi et al and Wang et al mean birth

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weight was
2.34 and 2.22±0.55 respectively which was higher when compared to present study because they have used only term SGA babies as cases whereas in present study and Pardo et al study both term and preterm SGA were included in the study group.[4,5,8]

In the present study average Ponderal index was
1.83±0.23 which was statistically significant with a p<0.001 and in study by Kelishadi et al.[4] It was 2.18, and it was not significant statistically.

In the present study gestational age was found out to be
36.78±2.09 weeks, which was similar to the study by Pardo et al with a gestational age of 35.57±0.11 weeks, as both studies have included both term and preterm SGA neonates in the study group.[5] Other studies like Kelishadi et al and Wang et al had higher gestational age as they had included only term SGA neonates in study group.[4,8]

In the present study preterm had significantly higher values of TC, TG, HDL, LDL, VLDL (p<0.001, <0.01,
<0.001, <0.001, <0.01 respectively) compared to term neonates. AI values were more in preterm compared to term which was not statistically significant. Haridas et al in their study concluded that preterm neonates have higher TG and TC levels but statistically significant difference was found only in TC (p<0.001) levels.[15]

Mathur et al in their study concluded that in preterm TC value was significantly high (p<0.001).[16]

Oba et al in their study concluded that TC, LDL, HDL values were significantly higher in preterm neonates (p<0.0001), TG value was significantly lower in preterm neonates (p<0.01).[10]

Pardo et al in their study concluded that TC, LDL, HDL were higher in Preterm neonates compared to term neonates with statistically significant difference in TC and LDL (p<0.001) levels, but HDL had no statistically significant difference.[5] AI values were more in preterm compared to term which was not statistically significant.

Kalra et al in their study concluded that all cord lipid profile values were lower in preterm neonates compared to term neonates but statistically significant difference was found with TC levels (p<0.001) and no statistically significant difference was found with HDL and LDL levels.[13]

Singh et al in their study concluded that term neonates had higher TC compared to preterm neonates with statistically significant difference (p<0.05).[6]

Mishra et al in their study concluded that TG levels were more in term compared to term with no statistically significant difference.[14]

CONCLUSION

The study found that there was no significant difference in cord lipid profile between males and females in both term and preterm neonates. Preterm neonates had higher values of TC, TG, HDL, LDL, VLDL compared to term neonates, and values were statistically significant.Cord

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blood lipid profile values for TG, TC, LDL and VLDL were significantly higher, and HDL were significantly lower in the SGA neonates compared to AGA neonates.Term SGA had significantly higher cord blood lipid profile values compared to the Term AGA, except HDL levels. Preterm AGA had higher cord lipid profile values compared to the Term AGA neonates, and values were statistically significant. Preterm SGA neonates had lower cord lipid profile of TC, HDL, and LDL as compared to Preterm AGA, which were statistically significant.

REFERENCES

1. Kent L, Thomburg. Fetal Origins of Cardiovascular Disease. Am Academy Pediatr. 2004;5(12):527-34.
2. Verkauskiene R, Czernichow P, Claire LM. Long- term metabolic consequences of being born small for gestational age. Expert Rev Endocrinol Metabol. 2006;1(1):439-47.
3. Jones J N, Taylor Gercel, Taylor Doughlas D. Altered cord serum lipid levels associated with small for gestational age infants. J Am College Obstetr Gynaecol. 1999;93:527-31.
4. Kelishadi R, Badiee Z, Adeli K. Cord blood lipid profile and associated factors: bascline data of a birth
5. cohort study. Paediatric Perinatal Epidemiol. 2007;21:518-24.
6. Pardo IMCG, Geloneze B, Tambascia MA, Barros Filho AA. Atherogenic lipid profile of Brazilian near term newborns. Braz J Med Biolog Res. 2005;38(5):755-60.
7. Singh J, Purohit M, Singh P, Thappa DM. Cord Blood Cholesterol in Term and Preteterm Newborns. Indian Pediatr. 1994(31):1278-80.
8. Daniel ML, Walter JM. Factors affecting the lipid and Apolipoprotein levels of cord sera. Pediatr Res. 1983;17:83-91.
9. Averna MR, Barbagallo CM, Dipaola G, Labisi M, Pinna G, Marino G, et al. Total cholesterol IDL- Cholesterol and lipoprotein B in umbilical cord blood: cross sectional study. Minerva-Pediatr. 1992;44:395-9.
10. Hossain MA, Islam MN, Shahidullah M, Akhter H. Serum triglyceride level in IUGR babies and its comparison with preterm AGA and term normal babies. Mymensingh Med J. 2006;15(2):180-82.
11. Oba J, Sirlei Donega, Raul C, Maranhao Concentration of serum lipids and Apolipoprotein B in Newborn. Arquivos Brasileiros Cardiol. 2006;31(86):6.
12. Leon DA, Lithell HO, Vagero D, Koupilova I, Mohsen R, Berglund L, et al. Reduced fetal growth rate and increased risk of death from ischaemic heart disease: cohort study of 15000 Swedish men and women born 1915-29. Br Med J. 1998;317(7153):241-5.
13. Rich-Edwards JW, Stampfer MJ, Manson JE, Rosner B, Hankinson SE, Colditz GA, et al. Birth weight and risk of cardiovascular disease in a cohort of women followed up since 1976. Br Med J. 1997;315(3):96-400.
14. Kalra A, Kalra K, Agarwal MC, Prasad R, Pant MC Bhatia R, et al. Serum lipid profile in term and preterm infants in early neonatal period Indian Pediatr. 1988;2:977-81.
15. Mishra PK, Tiwari DK, Sharma B, Kaul R. Free fatty acids and Triglycerides in normoglycemic low birth weight newborns in Carly neonatal period. Indian J Pediatr. 1984;51(1):637-41.
16. Haridas N, Acharya PT. Serum Lipid Status in neonates. Indian Pediatr. 1984;21(4):327-34.
17. Mathur PP, Prasad R, Jain SK, Pandey DH, Singh SP. Cord blood Cholesterol in term and preterm newborns. Indian Pediatr 1986;23(2):103-6