International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 02 Issue 09 September 2017, ISSN No. - 2455-8737
Available online at - www.ijirms.in

Open Access Journal | Research Article | DOI: 10.23958/ijirms/vol02-i09/16

Evaluation of Lipid Profile in Premature, Near-term and Term Newborn Infants

Dr. Ram Manohar Kurrey[1], Dr. Kavita J. Lall[2], Dr. Karan Singh Chandrakar

[1]Assistant Professor Department of Pediatrics CCM Medical College, Kachandur, Durg (CG)
[2]Associate Professor Department of Pediatrics CCM Medical College, Kachandur, Durg (CG)
[3]Assistant Professor Department of Pathology CCM Medical College, Kachandur, Durg (CG)

Abstract

In this study we evaluate the activity of lipid profile in premature, near term and term neonates. A total number of 68 newborn infants were selected for this study. They were delivered normally, or by caesarean section, and their gestational age was included. The infants with congenital anomalies or those, whose mothers had medical problems, were excluded from the study. The gestational age was determined according to the date of the last menstrual period, or the early ultrasound in 20 weeks of gestation. All the information related to the newborns and their mothers were recorded in the prepared forms. Following the delivery, blood samples were taken from the umbilical cord immediately, and were separated after clotting, for at least 30 min at room temperature. Serum was stored at 4°C to -80C for a maximum of 2 days, prior to the analysis. Total cholesterol, triglycerides and HDL were analyzed by enzymatic method using auto-analyzer. Serum Total Cholesterol estimated by enzymatic kit method, Triglyceride estimated by bioluminescent assay method and HDL-cholesterol estimated by phasphotungstate precipitation method manufactured by ERBS Transasia. LDL-C and VLDL-C calculated by Friedewald formula.

The three groups were significantly different, regarding the means of age, weight and cholesterol and LDL-C level, whereas no significant difference was observed concerning the level of triglyceride and HDL-C,. Gender has no effect on the level of cholesterol, triglyceride, HDL-C and LDL-C in the total population and in all subgroups (P value more than 0.05). On the basis of present study we assume that the cholesterol level was higher in those with prematurity and pre-term delivery, and is also inversely correlated with the infant's birth weight. Therefore, we believe that monitoring, observation and early-lifestyle modifications may decrease the severity of atherosclerosis in the vessels in adulthood. This study says, it is evident that the total cholesterol and LDL cholesterol in premature and near term neonates was higher than a term neonates ; triglyceride and VLDL were higher in term neonates as compared to near term neonates. Fall in HDL was significantly observed in premature neonates than term neonates and near term neonates but no significance found in term and near term neonates.

Keywords: ***CH, TG, HDL-C, LDL,-C, VLDL-C, LBW, CVD, Term, Near Term, Premature.***

Introduction

The fetus needs a considerable amount of cholesterol for the development of tissues and organs. After birth, human lipid transportation system changes from containing low levels of very-low-density lipoprotein (VLDL), and low-density lipoprotein (LDL), to the adult pattern, which continues to increase with age.[1] Preterm birth is defined as delivery prior to 37 completed weeks or 259 days of gestation. It is a major challenge for maternal and perinatal care providers worldwide and a leading cause of neonatal morbidity and mortality. Children born pre-maturely have higher rate of learning disability, cerebral palsy, sensory deficits and respiratory illnesses compared to children born at term.[2] These negative health and developmental effects of preterm birth often extend to later life, resulting in enormous medical, educational, psychological and social costs.[3] Premature newborns do not have the opportunity to complete their energy deposits, so they need to use their endogenous reserves basically activating lipid metabolism. The long term consequences of these adaptations have not been explained.

LDL is the major cholesterol, which carrying particle of cholesterol in the plasma. HDL is responsible for transporting cholesterol back from the tissues to the liver. Race and gender differences in lipoproteins levels have repeatedly been demonstrated in adults.[4,5] These differences have also been noted in children, supporting the concept that the variance is due to genetic influences, rather than environ-mental factors.[6]

Human fetuses are known to permanently change their physiology and metabolism to adapt to limited supply of nutrients. These programmed changes can later be the cause for the origin of diseases like coronary artery disease, diabetes mellitus and hypertension. The cord blood

DOI: 10.23958/ijirms/vol02-i09/16

cholesterol level in infants is lower than the adults.[7] The correlation of cord blood lipid profile in pre mature neonates, near-term and term infants with their anthropometric data and their predictive role as markers for adulthood diseases are still not completely explored. Hence the present study was designed to study cord blood lipid heterogeneity at birth of in pre mature neonates, near-term and term infants at CCM Medical College and Hospital.

The Objectives of the Study

1. To estimate the level of lipid profile in Pre mature neonates cord blood.
2. To evaluate lipid profile of cord blood of term neonates.
3. To find out level of lipid profile in near term newborn infants.
4. To compare lipid profile of cord blood of pre matures, near-term neonates and term neonates.
5. To compare lipid profile in Term and Near Term neonates.
6. To compare lipid profile in Premature and Term neonates.
7. To compare lipid profile in Premature and Near Term neonates

The present study was carried out in the Dept. of Pediatrics in collaboration with Dept. of Biochemistry, OBGY and Medicine at Chandulal Chandrakar Memorial Medical College and Hospital Kachandur, Durg.

Study design: Hospital based prospective study conducted in our Hospital.

Materials and Methods

A total number of 68 newborn infants were selected for this study. They were delivered normally, or by caesarean section, and their gestational age was included. The infants with congenital anomalies or those, whose mothers had medical problems, were excluded from the study. The gestational age was determined according to the date of the last menstrual period, or the early ultrasound in 20 weeks of gestation. All the information related to the newborns and their mothers were recorded in the prepared forms. Following the delivery, blood samples were taken from the umbilical cord immediately, and were separated after clotting, for at least 30 min at room temperature. Serum was stored at 4°C to -80C for a maximum of 2 days, prior to the analysis. Total cholesterol, triglycerides and HDL were analyzed by enzymatic method using auto-analyzer. Serum Total Cholesterol estimated by enzymatic kit method[8], Triglyceride estimated by bioluminescent assay method[9] and HDL-cholesterol estimated by phasphotungstate precipitation method[10] manufactured by ERBS Transasia. LDL-C and VLDL-C calculated by Friedewald formula.

Following formulae were used[11]:

For VLDL Cholesterol in mg % =Serum Triglyceride / 5

Serum LDL = Serum total cholesterol - (serum VLDL + Serum HDL).

The study samples were divided into three subgroups, according to their gestational age: The premature (≤ 34 weeks of gestational age), the near-term (35 –37 weeks of gestational age) and the term group (≥ 38 weeks of gestational age).

Table1: Distribution of study group (Premature, Near-term and Term Newborn Infants)

	Number of subjects (male/female)	Age-range (Weeks)
Total Newborn	68 (41/27)	27-42
Premature	19 (13/6)	Less than 34
Near-term Newborn	22 (13/9)	Between 35-37
Term Newborn	27 (15/12)	More than 38

Table2: Shows stastical analysis of study group

	No of Sample	Min	Max	Mean	SD
Age (weak)	68	27	40	35.83	4.97
Weight (gm)	68	1300	3900	2398.60	548.93
Total Cholesterol (mg/dl)	68	43	259	87.59	37.53
Triglyceride (mg/dl)	68	17	117	57.74	21.62
HDL-C (mg/dl)	68	26	139	32.83	20.27
LDL-C (mg/dl)	68	19	95	60.47	24.57

Table2 shows the minimum, maximum, mean and SD of Total Cholesterol, Triglyceride, HDL-cholesterol and LDL-cholesterol in study group.

DOI: 10.23958/ijirms/vol02-i09/16

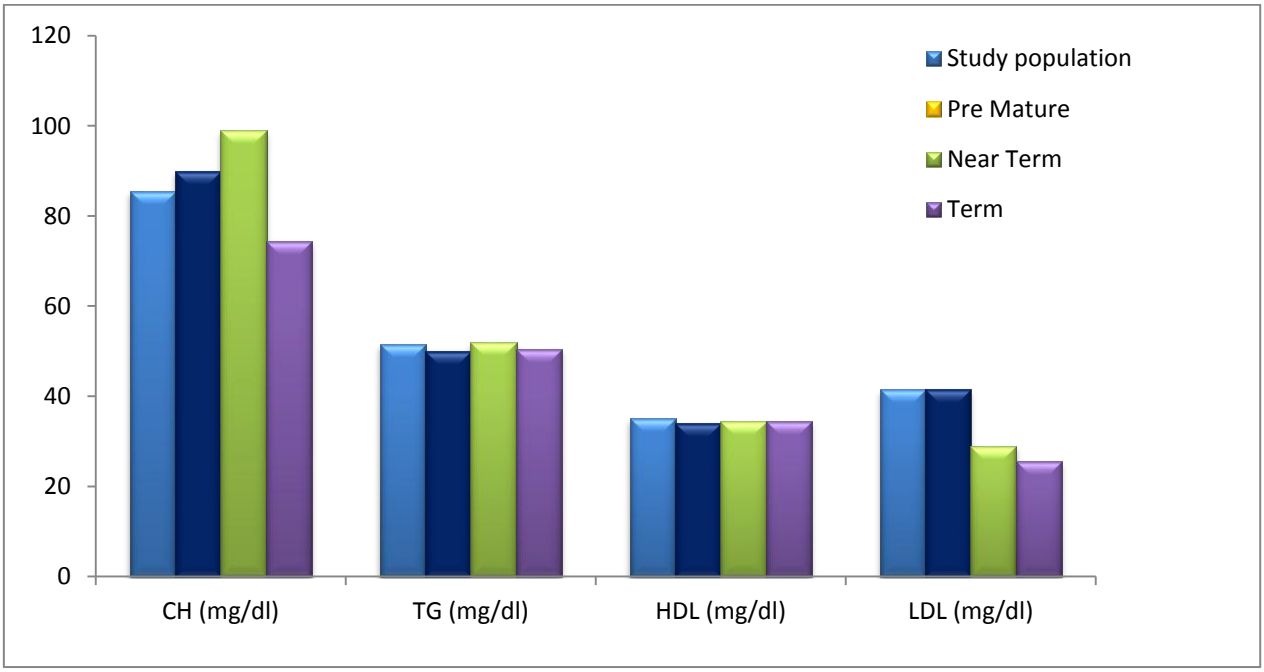
Data Analysis

Data were expressed as mean ± SD. The ANOVA test was used to compare the variance between the different categories; Student t-test was used to compare the difference between the two means; and Spearman test was used for the correlation. P-value less than 0.05 were regarded as significant. A statistical analysis was performed using the Stastical Package for the Social Science program (SPSS, 23.0). Frequencies and percentages were used for the categorical measures.

Results and Discussion

Table 3: Shows the comparison of lipid profile in Premature, Near-term and Term Newborn Infants

Biomedical Parameters	Study Population			Pre Mature n= 19			Near Term n=22			Term n=27		
	M	F	'p'	M	F	'p'	M	F	'p'	M	F	'p'
Weight	2469	2398	0.85	1673	1648	0.84	2417	2483	0.65	2983	2980	0.81
CH (mg/dl)	88	83	0.89	91	89	0.90	99	99	0.98	76	73	0.23
TG (mg/dl)	49	52	0.87	57	43	0.21	45	59	0.21	50	51	0.90
HDL(mg/dl)	37	33	0.19	31	37	0.20	35	34	0.63	39	30	0.09
LDL(mg/dl)	45	38	0.01	42	39	0.83	30	28	0.58	27	24	0.43



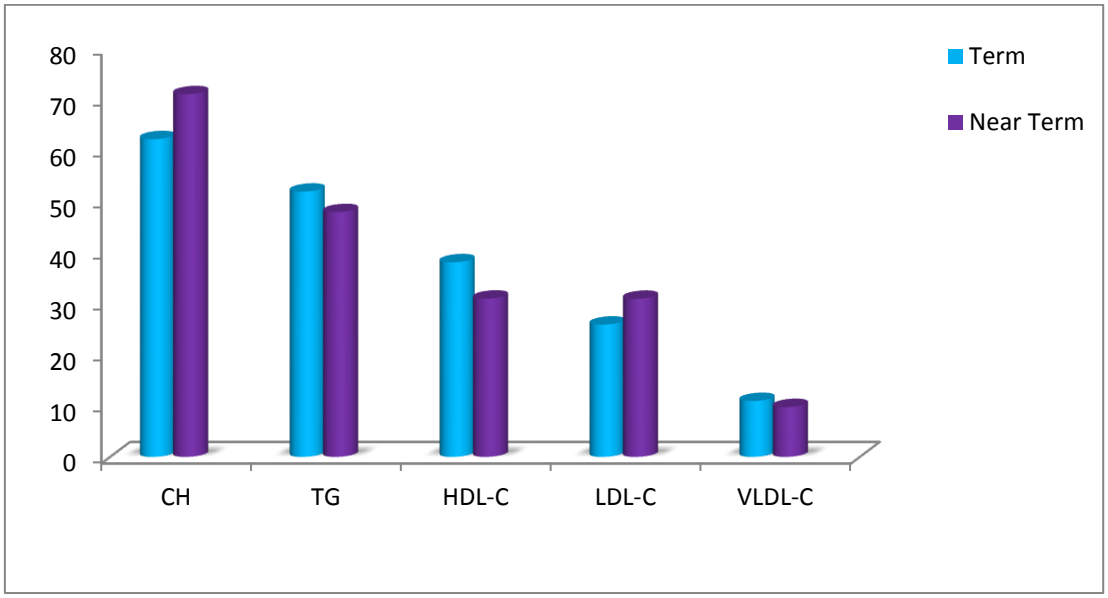
Graph1: shows comparison of lipid profile in Premature, Near-term and Term Newborn Infants

Table3 shows a total number of 68 newborn babies were selected for study, had the mean gestational age of 35.83± 4.97 weeks; the mean body weight was 2398.60 ± 548.93 g. The means of cholesterol, triglyceride, HDL and LDL are shown in Table 3.

Table4: Serum Lipid Profile in term and near term neonates

Parameters	Term (n=22)	Near Term (n=27)	'P' value
Total Cholesterol	62.25 ± 0.65	71.03 ± 0.92	0.001
Triglyceride	51.98 ±0.73	47.98 ± 0.69	0.051
HDL-C	38.17 ± 0.38	31.06 ± 0.40	0.048
LDL-C	25.98 ±0.82	31.03 ± 0.58	0.001
VLDL-C	10.98 ±0.11	9.79 ± 0.14	0.082

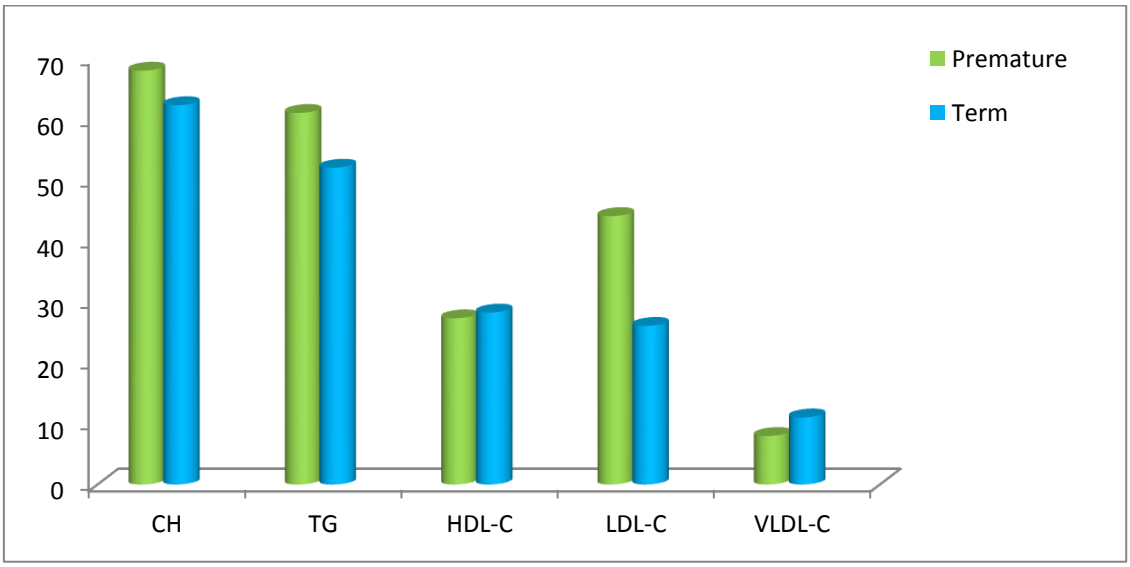
DOI: 10.23958/ijirms/vol02-i09/16



Graph 2: Shows comparison Serum Lipid Profile in term and near term neonates

Table5: Serum Lipid Profile in Premature and Term neonates

Parameters	Premature	Term (n=22)	'P' value
Total Cholesterol	67.94 ± 1.98	62.25 ± 0.65	0.005
Triglyceride	60.98 ± 2.17	51.98 ±0.73	0.043
HDL-C	27.23 ± 0.40	28.17 ± 0.38	0.050
LDL-C	44.03 ± 3.58	25.98 ±0.82	0.001
VLDL-C	7.94 ± 1.04	10.98 ±0.11	0.083

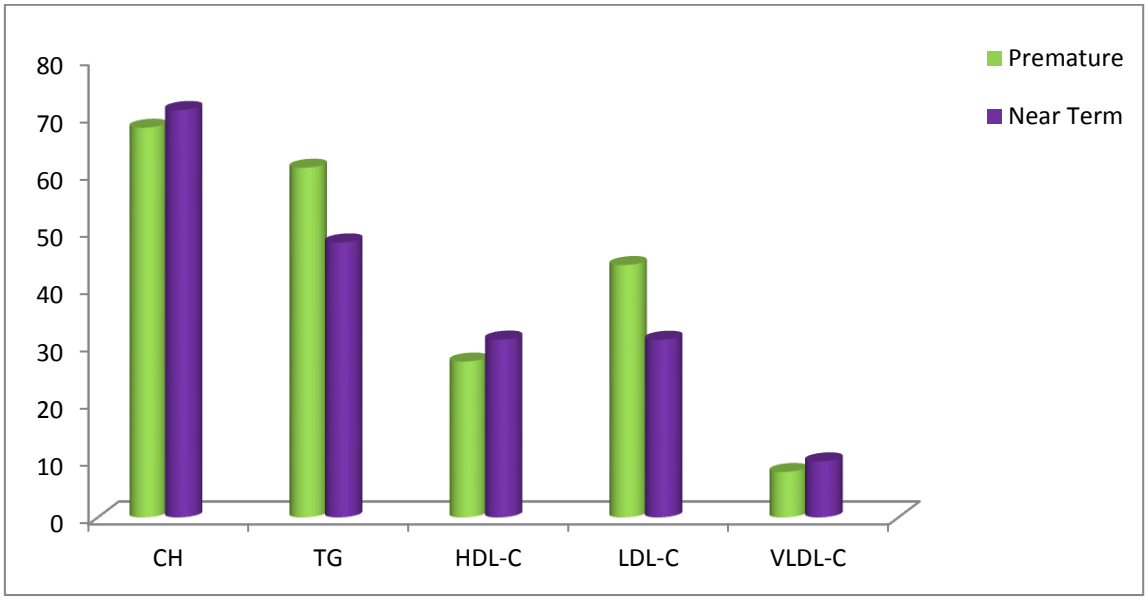


Graph 3: shows Serum Lipid Profile activity in term and near term neonates

Table6: Serum Lipid Profile in Premature and Near Term neonates

Parameters	Premature	Near Term (n=27)	'P' value
Total Cholesterol	67.94 ± 1.98	71.03 ± 0.92	0.001
Triglyceride	60.98 ± 2.17	47.98 ± 0.69	0.053
HDL-C	27.23 ± 0.40	31.06 ± 0.40	0.081
LDL-C	44.03 ± 3.58	31.03 ± 0.58	0.001
VLDL-C	7.94 ± 1.04	9.79 ± 0.14	0.072

DOI: 10.23958/ijirms/vol02-i09/16



Graph4 shows Serum Lipid Profile level in term and near term neonates

All value of CH, TG, HDL-C, LDL-C and VLDL-C are expressed in mg/dl.

CH -Cholesterol
TG - Triglyceride
HDL-C- High density lipoprotein
LDL - C - Low density lipoprotein
VLDL - C- Very Low density lipoprotein

According to the gestational age, the study population was divided into major three groups: The premature (age ≤ 34 weeks), the near-term (age 35-37 weeks) and the term group (age ≥ 38 weeks).

The three groups were significantly different, regarding the means of age, weight and cholesterol and LDL-C level, whereas no significant difference was observed concerning the level of triglyceride and HDL-C, as it is shown in Table 3. Gender has no effect on the level of cholesterol, triglyceride, HDL-C and LDL-C in the total population and in all subgroups (P value more than 0.05), as it is shown in Table 3.

Table no4, 5 and 6 shows that the activity of CH, TG, HDL-C, LDL-C and VLDL-C. There significant difference found in level of CH and LDL but no significant difference has found in TG, HDL-C and VLDL-C. The level of CH and LDL were 67.94 ± 1.98, 62.25 ± 0.65, 71.03 ± 0.92 and 44.03 ± 3.58, 25.98 ±0.82, 31.03 ± 0.58 in premature, term and near term neonates respectively. Similar finding were observed by Raid M.R.[12] shows the significant difference in age, weight, CH and LDL-C and there is no significance in gender and activity of TG, HDL-C and VLDL-C. This is in contrast with the previously reported findings on cord blood cholesterol level, which is found to be higher in females than in males.[13]

Worldwide, 15.5 percent of all births, more than 20 million, are born as low birth weight (LBW) babies. India alone accounts for 40 per cent of the incidence of LBW babies in the developing world[14] LBW is associated with increased incidence of CVD, hypertension, and type 2 diabetes in adult life.[15] LBW is a risk of later atherosclerotic diseases that is equal to smoking or hypertension at puberty. Changes in blood lipids in LBW newborns with relative insulin intolerance can increase the risk of CVD in adulthood.[16,17,18] According to Barker et al, the newborn with low body mass index and thin built at birth will under lesser risk of CVD in a future. Risk will increase further if there any rapid weight and/or fat gain during childhood after infancy and adolescence.[18]

It is interesting that fetal growth retardation establishes a lifelong irreversible atherogenic profile, and that the history of low birth weight[19], or pre-term birth[20] in individuals, are associated with apolipoprotein B levels. Several studies have also demonstrated that abnormal lipoprotein profiles in childhood persist into adult life. The prevalence and severity of carotid artery atherosclerosis in later years are linked to lower birth weights. These findings indicate that fetal growth restriction is associated with a chronic pattern of atherogenic lipoprotein metabolism.[21]

Conclusion

The present study assumes that the cholesterol level was higher in those with prematurity and pre-term delivery, and is also inversely correlated with the infant's birth weight. Therefore, we believe that monitoring, observation and early-lifestyle modifications may decrease the severity of atherosclerosis in the vessels in adulthood. This study says, it is evident that the total cholesterol and LDL cholesterol in premature and near term neonates was higher than a term neonates ; triglyceride and VLDL were higher in term

DOI: 10.23958/ijirms/vol02-i09/16

neonates as compared to near term neonates. Fall in HDL was significantly observed in premature neonates than term neonates and near term neonates but no significance found in term and near term neonates. Hence, it was clearly visible a trend to worse lipid profile in Indian premature and near-term infants. It may be interesting to see whether these susceptible neonates are at increased risk of developing cardiovascular diseases in future.

References

[1] Kharb S, Kaur R, Singh V, Sangwan K. Birth Weight, Cord Blood Lipoprotein and Apolipoprotein Levels in Indian Newborns. Int J Prev Med. 2010; 1(1): 29-33.
[2] Behrman RE, Butler AS, editors. Preterm birth: causes, consequences, and prevention. National Academies Press; 2007 Apr 23.
[3] Lawn JE, Wilczynska-Ketende K, Cousens SN. Estimating the causes of 4 million neonatal deaths in the year 2000. International Journal of Epidemiology. 2006;35(3):706–18
[4] Loughrey CM, Rimm E, Heiss G, Rifai N. Race and gender differences in cord blood lipoproteins. Atherosclerosis. 2000; 148 (1): 57-65.
[5] Bachorik PS, Lovejoy KL, Carroll MD, Johnson CL. Apolipoprotein B and AI distributions in the United States, 1988–1991: results of the National Health and Nutrition Examination Survey III (NHANES III). Clin Chem. 1997; 43 (12): 2364–78.
[6] Srinivasan SR, Berenson GS. Childhood lipoprotein profiles and implications for adult coronary artery disease: the Bogalusa Heart Study. Am J MED Sci. 1995; 310: 62-7.
[7] Bansal N, Cruickshank JK, McElduff P, Durrington PN. Cord blood lipoproteins and prenatal influences. Current Opinion in Lipidology. 2005; 16(4): 400-8.
[8] Allain C, Poon L, Richmond N. Enzymatic determination of total cholesterol Clin. Chem 20/4 (1974): 470-475.
[9] Werner M, Gabrielson DG, Eastman G. Ultra micro determination of serum TG by bioluminescent assay. Clin Chem 1981; 27; 268-71.
[10] Burnstein M.M, Miller G.J. Gidez L.I. Phosphotungstate Mg2 = precipitation method for HDL-cholesterol quantitation. jr. lipidres 1970; 11; 583.
[11] Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. ClinChem.1972;18:499-502.
[12] Raid M. R. Umran Tohmaz. Cord Blood Lipid Profile in Premature, Near-Term and Term Newborn Infants. Iranian Journal of Neonatology 2013; 4(4): 8-10.
[13] Bastida S, Sanchez-Muniz FJ, Cuesta C, Perea S, Aragones A. Male and female cord blood lipoprotein profile differences throughout the term-period. J Perinat MED. 1997; 25: 184-91.
[14] WHO and UNICEF. Low birth weight: Country, regional and global estimates, Geneva: World Health Organization; 2004.
[15] Barker DJ, Hales CN, Fall CH, Osmond C, Phipps K,Clark PM.Type 2 (non-insulin-dependent) diabetesmellitus, hypertension and hyperlipidemia (syndrome X):relation to reduced fetal growth. Diabetologia.1993Jan; 36(1), 62-7.
[16] Mi J, Law C, Zhang KL, Osmond C, Stein C, Barker D. Effects of infant bi rth weight and maternal body mass index in pregnancy on components of the insulin resistance syndrome in China.Ann Intern Med.2000Feb; 132(4), 253-60.
[17] Molina M, Casanueva V, Cid X, Ferrada MC, Pérez R, Dios G, et al. Lipid profile in newborns with intrauterine growth retardation. Rev Med Chil. 2000 Jul; 128(7), 741 8.
[18] Barker DJ, Winter PD, Osmond C, Margetts B, Simmonds SJ. Weight in infancy and death from ischemic heart disease.Lancet.1989 Sep9; 2(8663):577-80.
[19] Irving RJ, Belton NR, Elton RA, Walker BR. Adult cardiovascular risk factors in premature babies. Lancet. 2000; 355: 2135-6.
[20] Lindsay RS, Dabelea D, Roumain J, Hanson RL, Bennett PH, Knowler WC. Type 2 diabetes and low birth weight: the role of paternal inheritance in the association of low birth weight and diabetes. Diabetes. 2000; 49(3): 445-9.
[21] Kharb S, Kaur R, Singh V, Sangwan K. Birth Weight, Cord Blood Lipoprotein and Apolipoprotein Levels in Indian Newborns. Int J Prev Med. 2010; 1(1): 29- 33.

Corresponding Author -

Dr. Karan Singh Chandrakar

Assistant Professor Dept. of Pathology, CCM Medical College Kachandur, Durg Chhattisgarh 490024
***Email Id** - ambad.sawan@gmail.com.*
Mob no: - 7999678840

DOI: 10.23958/ijirms/vol02-i09/16