Original Article

# Abdominal circumference – its relation to blood lipid levels in new born.

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**ABSTRACT**

**Introduction:** Low Birth weight (LBW) is one of the important high risk factor among the new borns. High lipid levels in L.B.W.babies developing cardiovascular risk in adulthood is documented. High lipid levels in new born may be related to liver size as one determinant of abdominal circumference. Thus there is relation between lipid levels and abdominal circumference in new born . It may be used as a risk factor for predicting future cardiovascular disease risk.

**Aim :** To study the relation of cord blood lipid levels and abdominal circumference

**Materials and methods:** This is an observational cross sectional study conducted at KIMS Narketpally between Sep2011 and Aug2012.102 term newborns were included in the study.Total cholesterol(TC),Triglyc erides(TG),High density lipoproteins(HDL),Low density lipoproteins(LDL),Very low density lipoproteins were estimated in the cord blood.

**Results:** Abdominal circumference was recorded and babies were divided into three groups depending on the values.Those with abdominal circumference <26cms,26-28cms >28cms. HDL and LDL levels were almost similar in all the three groups .Where as TC,VLDL&TG levels were significantly high (Pvalue<0.05) in babies with low abdominal circumference of <26cms; compared to other two groups

**Conclusion:** In our study statistically significant weak correlation was observed between cord blood lipids like TC,TG,andVLDL in term new borns. Abdominal circumference <26cms may be used as high risk factor in the new born for predicting future cardiovascular disease risk.

**Key words:** Abdominal circumference, cord blood lipid levels, new born, cardiovascular risk

## Introduction

Foetal origin hypothesis is based on the high risk of developing cardio vascular disease in those babies born prematurely and with intrauterine growth retardation particularly in asymmetric group (Barker)[1].

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The risk of developing cardio vascular disease is high in those babies born prematurely and with intrauterine growth retardation particularly asymmetric group[1] (BARKER). High lipid levels in newly born preterm and SGA Babies, are associated with high risk of Cardio Vascular Disease (CVD) in later part of life (adults). High lipid levels may be related to liver size[2]. Liver size is one of the important determinants of abdominal circumference. As the abdominal circumference is dependant on the liver size it may give clue about the high lipid levels[3]. If the relation between the abdominal circumference and the lipid levels are

known then abdominal circumference can be used as a parameter for identifying the high risk babies in preterm and SGA babies likely to develop CVD.

Hence we proposed a question: **"Is abdominal circumference related to levels of lipid profile in newborns and if so, is it positive or negative correlation?"**

**Aims and objectives of the study:** to study the cord blood lipid levels and correlate them with abdominal circumference in term new born.

**Material and methods:**

The study was conducted in the department of paediatrics at Kamineni institute of medical sciences, Narketpally.

STUDY DESIGN: This is an observational cross sectional study undertaken between September 2011 and August 2012.

A total of 102 term newborns, delivered at KIMS, Narketpally, fulfilling the inclusion criteria were taken up for study.

**Inclusion criteria:** Term newborns.

**Exclusion criteria:** 1) Preterm babies,Post term babies 2) Birth asphyxia. 3) Multiple births. 4) Sick babies 5) Babies with anomalies, 6) Babies born to mothers with Polyhydramnios, Oligohydramnios, Diabetes, PIH (Pregnancy induced Hypertension)

Written informed consent was taken from either of the parents for including the new borns in the study. 5 ml of umbilical cord blood(mixed arterial and venous blood) was collected from newborns under study in plain test tube to be used for the estimation of serum lipid profile.

Serum lipid profile included Total Cholesterol(TC), HDLHigh Density Lipoproteins (), LDL (Low Density Lipoprotein), VLDL (Very Low Density ;ipoprotein) and TG (Triglyceride) levels.Lipid levels were estimated by Enzymatic-calorimetric method, using semi-auto analyzer. Newborns under study were subjected to thorough physical examination and abdominal circumference was measured at the level of umbilicus by using non-stretchable measuring tape.

The data was entered in a pre structured proforma.

**STATISTICAL ANALYSIS**

**Statistical software:** The package EPI-INFO version 19 was used for the analysis of the data and Microsoft Excel was used for data entry as well as to generate graphs, tables etc. Results were expressed as mean ± standard deviation for continuous variables and as number and proportion (%) for categorical variables. Pearson correlation coefficient was used to analyze relationship between lipid profile and abdominal circumference. Each variable was evaluated and a p-value<0.05 was considered significant.

**Observations and results**

Total number of cases studied were 102. Sex wise distribution of total 102 cases are shown in table1. Males constituted 49 comprising 52%, where as females constituted 53 comprising 48% almost having near equal distribution.Mean values of cord blood lipid profile are in table2. lipid profile included total cholesterol 62.39±mg%, high density lipoproteins25.85±mg%, low density lipoproteins 21.65±mg%, very low density lipoproteins 12.58±mg%.

**Table 1:** Sex wise distribution of the cases (n=102)

| Sex | No. of New Borns (N=102) |
|---|---|
| Male | 49(48.03%) |
| Female | 53(51.96%) |
| Total | 102 (100%) |

Out of total 102 new borns 49( 48.03%) are males & 53( 51.96%) are females.

**Table 2:** Mean values ( mg/dl) and standard deviation of cord blood lipid profile in new borns.

| Sl. No | Lipid profile | New Borns (N=102) (Mean±SD)(mg/dl) |
|---|---|---|
| 1 | TC | 62.39±18.62 |
| 2 | HDL | 25.85±8.53 |
| 3 | LDL | 21.65±15.05 |
| 4 | VLDL | 12.58±7.72 |
| 5 | TG | 65.11±47.40 |

TC : total cholesterol, HDL: high density lipoprotein, LDL: low density lipoprotein, VLDL: very low density lipoprotein. TG : triglycerides.

Table 3 is showing the distribution of mean values of lipid levels in relation to abdominal circumference of the new borns studied.New borns were divided into three groups based on abdominal circumference.Those with abdominal circumference <26cm,26cm-28cm and >28cm. 21 Babies had Abdominal circumference <26cm. Where as 30 babies had abd circumference 26-28cm, and about 50% of the babies i.e., 51 had abd circumference >28cm.TC,VLDL,&TG Levels are high in babies with low abdominal circumference <26 cms and the values are statistically significant with pvalue <0.05.But HDL and LDL levels are almost similar in all the three groups with no statistically significant difference (p value >0.05).

Table 4 shows correlation of lipid profile withabdominal circumference. A statistically significant weak negative correlationis observed between VLDL fraction Triglycerides and Total cholesterol with abdominal circumference.

Table 4: Correlation of lipid profile with abdominal circumference of new born(N=102)

| Sl. No | Lipid Profile | R | P |
|---|---|---|---|
| 1 | TC | -0.204** | 0.03* |
| 2 | HDL | -0.04 | 0.68 |
| 3 | LDL | -0.07 | 0.48 |
| 4 | VLDL | -0.328** | 0.001* |
| 5 | TG | -0.285** | 0.004* |

TC : total cholesterol, HDL: high density lipoprotein, LDL: low density lipoprotein, VLDL: very low density lipoprotein. TG : triglycerides.

**r= Pearson correlation coefficient(+1 indicates positive correlation,-1 indicates negative correlation,0 indicates no correlation, <0.5: weak correlation, 0.5-0.8 strong correlation, >0.8 very strong correlation.

*P value is considered significant when it is <0.05. A statistically significant weak negative correlation is observed between VLDL fraction of lipids, triglycerides and total cholesterol levels with abdominal circumference of newborns.

**Table 3. Mean lipid levels in relation to abdominal circumference**

| Abdominal circumference (cm) | TC (Mean±SD) (mg/dl) | HDL (Mean±SD) (mg/dl) | LDL (Mean±SD) (mg/dl) | VLDL (Mean±SD) (mg/dl) | TG (Mean±SD) (mg/dl) |
|---|---|---|---|---|---|
| <26(n=21) | 68.76±16.38* | 24.23±6.84 | 17.19±5.49* | 17.19±5.49* | 85.95±27.48* |
| 26-28(n=30) | 64.03±18.08* | 27.31±7.96 | 12.70±8.83* | 12.70±8.83* | 70.41±68.69* |
| >28(n=51) | 57.73±19.87* | 25.70±9.41 | 10.65±7.14* | 10.65±7.14* | 53.75±35.17* |

Total 102 cases are divided into 3 groups based on abdominal circumference. Number of new borns with abdominal circumference included: < 26cm-21(20.58%),26-28cm-30(29.41%) and > 28cm-51(50%).TC,VLDL and TG levels are high in babies with low abdominal circumference (<26cm) and values are statistically significant (pvalue<0.05) but HDL and LDL are almost similar in all the three groups with no statistical significance (pvalue >0.05). *P value significant.

## Discussion:

We have studied the cord blood lipid levels in relation to abdominal circumference in 102 term newborns. Almost equal number of males and females were included in the study to minimize gender related bias.

Total 102 cases were divided into three groups based on the values of abdominal circumference. The maximum value of abdominal circumference was 32.5cm and minimum value of abdominal circumference was 21.5cm, the values in between

these are divided into three groups.The cut off values for first group being 26cm and third group being 28cm and second group includes 26-28cm.( Number of newborns with abdominal circumference included ; <26cm- 21(20.58%), 26-28cm – 30(29.41%) and >28cm- 51(50%).)

The mean value of TG level was higher than the standard value.Total cholesterol, HDL,LDL levels are lower than the normal range.It appears that TG levels (65.11mg/dl) are higher in our population compared to the standard (34 mg/dl) value.

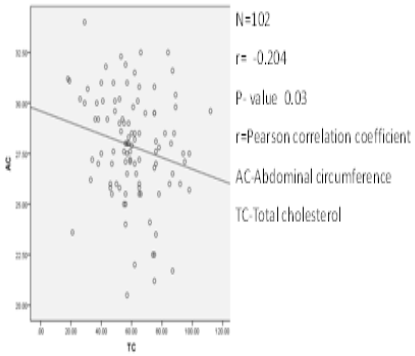
The mean values of TC,VLDL&TG levels in newborns with low abdominal circumference (<26cm) were higher than the mean values of total newborns in our population (68.76±16.38 Vs 62.39±18.62, 17.19±5.49 Vs 12.58±7.72 and 85.95±27.48 vs65.11±47.40, respectively). and the values are statistically significant for VLDL and TG levels( p-values being 0.001,0.002 respectively ).

The mean value of TG levels are also higher than the standard mean value.HDL and LDL are almost within the normal range in all the three groups in our population compared with international standard values.

It was observed that,with decreasing abdominal circumference the mean values of TC,VLDL& TG levels were increasing and the values are statistically significant with p-value of 0.001,0.001,0.002 respectively.

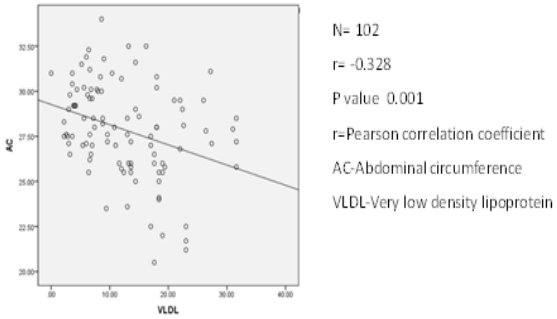
Graphs 1 to 5 are displaying the correlation of abdominal circumference to various fractions of lipids.

**Graph1:** showing correlation between abdominal circumference Vs total cholesterol (TC).



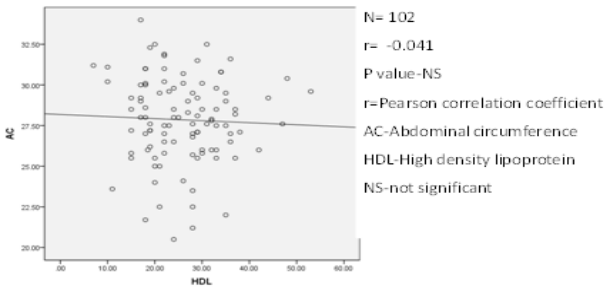

According to graph 1, there is statistically significant weak negative correlation observed between abdominal circumference of new born and total cholesterol ( r= -0.204,p value 0.03)

**Graph2:** showing correlation between abdominal circumference Vs HDL fraction of lipid profile.



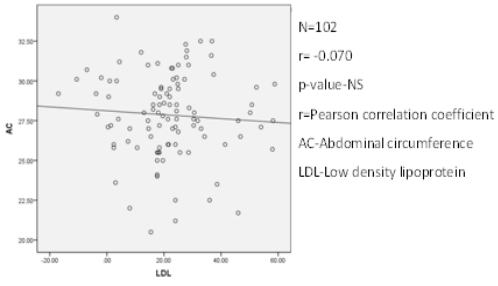

According to graph2, there is significant correlation observed between abdominal circumference of newborns and high density cholesterol .

**Graph3:**showing correlation between abdominal circumference Vs LDL fraction of lipid profile



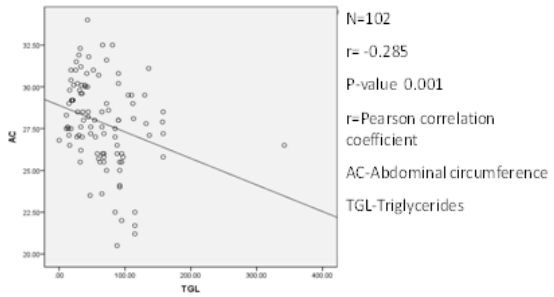

According to graph3, there is no significant correlation observed between abdominal circumference of new borns and low density cholesterol.

**Graph4:** showing correlation between abdominal circumference Vs VLDL fraction of lipid profile



According to graph 4, there is statistically significant weak negative correlation observed between abdominal circumference of new borns and VLDL (r = -0.328, p value= 0.001).

**Graph5:** showing correlation between abdominal circumference Vs triglycerides fraction of lipid profile




According to graph5, there is statistically significant weak negative correlation observed between abdominal circumference of new born and trigylceride levels (r = -0.285, p value:0.001)

A statistically significant weak negative correlation is observed between VLDL fraction of lipids, triglycerides and total cholesterol levels with abdominal circumference of newborns,in graphs 4,5 and 1 with r values of <0.5 (r=-0.328 p-value 0.001, r= -0.285 p-value 0.004 and r= -0.204 p-value 0.03 respectively).There is no significant correlation found between HDL and LDL fractions of lipid levels with abdominal circumference of newborns which is displayed in graphs 2 and 3. (r= -0.041, p>0.05 and r= -0.070, p>0.05 respectively).

Recently interest in umbilical cord lipids has increased because, lipid disorders in later part of life have their roots in childhood and atheromatous changes in adults are postulated to originate in foetal life[4]. There are several studies showing direct relationship between the abnormalities in lipid profile among the preterm & SGA neonates and occurence of cardiovascular disease in later life.[5,6]

The association of serum lipid concentrations with small abdominal circumference, suggest that lipid concentrations are related to growth failure in abdominal viscera, especially the liver. One explanation of our findings is that the low abdominal circumference, which indicates impaired growth of the liver leads to permanent changes in lipoprotein cholesterol metabolism as the liver is the main site for synthesis of lipoproteins.These changes, if they persist in later life may lead to development of hyperlipidemias and coronary artery disease, as suggested by Barker. Geloneze et al studied cord blood lipid profile in term and preterm new born where as our study is restricted to full term babies.[7] Tiwari et al studied the correlation of umbilical cord blood lipid levels and anthropometry at birth. They found no correlation of abdominal circumference and lipid profilelevels[8]. However in our study it is observed that there is a weak negative correlation between VLDL fraction of lipids, triglycerides and total cholesterol levels with abdominal circumference of newborns.

Our study is lacking in certain aspects like small sample size, not including preterm and SGA babies and better way of estimating the liver size. Probably with large sample size, including all the new borns pre and post term babies and utilizing the better imaging techniques to estimate liver size may yield better and more accurate results.

**Conclusions:**

In the present study There was statistically significant weak negative correlation observed between cord blood lipid profile values (VLDL fraction, triglycerides and total Cholesterol levels) with abdominal circumference in term newborns.

Low abdominal circumference in newborns (<26cm ), was associated with high TC and VLDL levels, and it may be used as a tool to predict cardiovascular disease risk in future

However it needs a further study with a larger sample size.

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