A Report of High Triglyceride Level in Cord Blood of Iranian Newborns

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ABSTRACT

Background: Since cord blood triglyceride level have been reported very different in recent articles, the purpose of this study is determination of triglyceride level in cord blood of Iranian newborns and compare it with other reports.

Methods: In this study, cord blood of 174 healthy term newborn infants (97 girls, 77 boys) born from healthy mothers have been used. Triglyceride level has been measured by calorie metric method. Statistical analysis was performed by independent t test, Mann-Whitney regression test and Spearman correlation coefficient method using SPSS 16.0 software (SPSS, USA).

Results: The mean of cord blood triglyceride was 1.37 ± 4.81 mg/dl and there was no statistical difference between two sexes. There was not exist linear relationship between triglyceride and weight, height, head circumference, body mass index and sex of the babies. In 8.6% of our newborn infants, triglyceride levels were more than 95th percentile of triglyceride level reported in Iranian population. In 33.9% of our cases, triglyceride levels were more than 95th percentile of triglyceride level reported in the Nelson text book of Pediatrics. In this study, the 95th percentile of triglyceride level in cord blood was 132.5 mg/dl.

Conclusion: The mean and 95th percentiles of triglyceride levels in cord blood of our newborn infants were higher than other reports. We recommend that larger studies should be conducted in this area to establish preventive ways for increasing epidemic of the metabolic syndrome.

Key words: Cord Blood Triglyceride, Iran, Mean, 95th percentiles

INTRODUCTION

The main increasingly causes of death in the most countries are cardiovascular diseases.[1,2] In our country (Iran) the onset age of these diseases is declining because of the increasing prevalence of their risk factors.[3,4] One of the most important risk factor for cardiovascular diseases is metabolic syndrome which is common in Iran.[5] In one study 31% of people older than 15 years had been suffering from this syndrome.[5] On the other hand the blood lipid disorder also is highly prevalent in Iran.[6,7] For protecting
public health medical interventions should be recommended to begin from childhood.\textsuperscript{[8,9]} Because cardiovascular diseases are rooted in childhood\textsuperscript{[10,11]} and childhood high blood lipid level is associated with its level in adulthood.\textsuperscript{[12]} People with high level of blood lipid in childhood are at risk for deaths from atherosclerotic cardiovascular disease in the later decades of life.\textsuperscript{[13]} For early prevention of atherosclerosis in high-risk communities, early interventions should be done when there is high level of triglyceride and cholesterol in a newborn infant with a positive family history of heart disease.\textsuperscript{[14]} The level of cord blood lipid could be a valuable index for predicting of hyperlipidemia in the next years of the life.\textsuperscript{[15]} There are some reports for the high triglyceride level in umbilical cord blood. Kelishadi has reported very high level of cord blood triglyceride in full term Iranian newborn infant compared to other countries.\textsuperscript{[9]} Waziri from Ahwaz, reported that the mean cord blood triglyceride level was meaningfully more than its level in the Nelson textbook of pediatrics.\textsuperscript{[16]} Sex related triglyceride cord blood level in the various studies are very different. In some articles its level in female is higher than males\textsuperscript{[17,18]} and in the other reports its level in males is higher than female.\textsuperscript{[19,20]} In some other reports, there are no significant differences between the sexes.\textsuperscript{[9,15]} We know that high triglyceride level in the umbilical cord blood is associated with some of diseases.\textsuperscript{[21-23]} But in one study, cord blood triglyceride level was not correlated to mother's triglyceride level.\textsuperscript{[24]} Hypertriglyceridemia in the cord blood (triglyceride level equal to or more than 95\textsuperscript{th} percentile of age) has been found with very different values. For example, it was from 48 mg/dl in China\textsuperscript{[21]} and 69 mg/dl in Chile\textsuperscript{[20]} to105 mg/dl in Iran.\textsuperscript{[9]} The 95\textsuperscript{th} percentile of cord blood triglyceride level in Nelson textbook of pediatrics as a reference book is 84 mg/dl.\textsuperscript{[25]} In one of our research project\textsuperscript{[26]} we observed higher level of triglyceride compared to available references. On the other hand the recent Iranian blood cord triglyceride level has been reported very high.\textsuperscript{[9]} Because of very different values for 95\textsuperscript{th} percentile of cord blood triglyceride level and high triglyceride level in 50\% of children and young people of Tehran, Iran.\textsuperscript{[27]} we conducted this study in purpose to evaluate the cord blood triglyceride level in our region and compare it with other reports.

**METHODS**

From healthy mother in teaching Vali-e-ASR hospital of Zanjan university of medical sciences in 2009. This research has been approved by deputy of research in Zanjan University of Medical Sciences and its ethical committee and has been performed by its financial support. The aim of this study explained to all mothers before sampling and their informed written consent have been formally taken. The necessary information was obtained and was recorded by a licensed nurse in previously provided forms. All newborn infants born from mothers with a history of diabetes, eclampsia and preeclampsia, dyslipidemia and chronic disease were excluded from the study. All newborn infants were visited by resident of pediatrics ward with faculty supervision. New born infants with fetal distress, 5\textsuperscript{th} minute Apgar score less than 7, clear anomaly and any other problem which needs to be treated were excluded and only healthy term infants (42-37 weeks) were enrolled. Undressed weight of newborn infants was measured by Seca weight scale with a sensitivity of 10 mg. Their height and in this study we used the cord blood of 174 healthy newborn infants (97 girl, 77 boy) born head circumference were measured by fabric height meter with a sensitivity of 1 mm in supine position. BMI (body mass index) calculated by using the formula kg/m\textsuperscript{2}. Duration of pregnancy calculated by using date of last period and/or ultrasound report. After clamping the umbilical cord, 10 ml blood was taken from placental side, centrifuged and then immediately stored at -20°c for 2 months to complete the sampling. The analysis of samples was performed using Selectra 2 autoanalyzer (vital scientific, spankeren, Netherlands). Lipid standard (C.P.As./Boehringer Mannheim, cat. no. 759350) was used to calibrate the selectra 2 autoanalyzer for each day of the experiment. Total cholesterol and triglyceride levels were measured by calorie metric method with a sensitivity of 0.5 mg/dl which has been done by GOD-PAP enzymatic method using cholesterol esterase, cholesterol oxidase and glycerol phosphate oxidase test with kits of Pars Azmon e Iran. HDL-cholesterol was measured by sedimentary method with phosphotangastic acid (PTA) and magnesium chloride. LDL-cholesterol was calculated by using the Friedwald's formula.\textsuperscript{[28]} Statistical analysis was performed by using SPSS 16.0 software (SPSS, USA). The mean, median and
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RESULTS

The populations of study were 174 healthy term infants (97 female and 77 male). The range of infants’ weight, height, head circumference and BMI were 2.500 to 3.970 grams, 45-56 cm, 37-31 cm and 10.3 to 16.1 respectively. Mean of weight, height, head circumference and body mass index totally and related to sex have been shown in Table 1. Differences in these variables between two sexes were not statistically significant. In this study, the range of gestational age was between 37 to 41 weeks (Mean = 39.1 ± 0.9). Range of mothers’ age was 14 to 40 years (Mean = 26.3 ± 5.9). Triglyceride level of cord blood was at least 31 mg to the maximum 270 mg/dl. (Mean = 81.4 ± 37.1) The mean of triglyceride in boys and girls were 83.8 ± 43.1 mg/dl and 79.5 ± 31.7 mg/dl respectively and it was not statistically significant. The 5th, 50th and 95th percentiles of triglyceride levels in total and related to sex can be seen in Table 2. Median cord blood triglyceride in two sexes had not statistically significant differences.

In examining the correlation coefficients between triglyceride and weight ($P = 0.83, r = 0.016$), head circumference ($P = 0.79, r = 0.020$), height ($P = 0.50, r = 0.051$) and BMI ($P = 0.66, r = 0.033$) linear relationship was not seen. There was not a statistically significant relationship between triglyceride level and neonatal variables related to sex. Mean level of cord blood lipids in this study totally and related to sex have been shown in Table 3. There was a correlation between triglyceride and cholesterol level ($r = 0.42$), triglyceride and NHDL level ($r = 0.39$), triglyceride and HDL level ($r = 0.23$) and triglyceride and LDL level ($r = 0.22$). The most correlation was between triglyceride and cholesterol level. There were no significant differences between the sexes in cord blood lipids.

| Neonatal variables | Total mean (174) | Male (77) | Female (97) | P value |
|-------------------|-----------------|----------|-------------|---------|
| Weight (g)        | 3166±32.9       | 3218±292 | 3124±352    | 0.063   |
| Height (cm)       | 50.1±1.8        | 50.3±1.7 | 49.9±1.9    | 0.19    |
| Head circumference(cm) | 33.9±1.4    | 34.1±1.4 | 33.8±1.3    | 0.23    |
| BMI (kg/m$^2$)    | 12.6±1.1        | 12.7±1   | 12.5±1.2    | 0.26    |

| Table 2: The 5th, 50th and 95th percentiles of cord blood triglyceride levels in total and sex related (mg/dl) |
|---------------------------------------------------------------|
| 95th percentile | 50th percentile | 5th percentile | Triglyceride (mg/dl) |
|-----------------|-----------------|----------------|---------------------|
| 132.5           | 75              | 41.5           | Total               |
| 127             | 74              | 39.7           | Female              |
| 230.5           | 77              | 44.9           | Male                |

| Table 3: The mean cord blood lipids in total and sex related (mg/dl) |
|-----------------------|-----------------|-----------------|---------------------|
|                       | Total Mean      | Male Mean       | Female Mean        | P value |
| TG                    | 81.4±37.1       | 83.8±43.1       | 79.6±31.7          | 0.45    |
| TC                    | 73.1±26.5       | 73.6±32.8       | 72.8±20.3          | 0.83    |
| HDL-C                 | 27.6±10         | 27.1±10.6       | 28.1±9.5           | 0.46    |
| LDL-C                 | 28.7±11.1       | 27.8±12.6       | 29.4±9.8           | 0.33    |
| NHDL-C                | 44.9±19         | 45.3±22.7       | 44.6±15.5          | 0.81    |

Note: TG, triglyceride; TC, total cholesterol; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; NHDL-C, non-high-density lipoprotein cholesterol
very weak, but there was no correlation between triglyceride level and gestational age \( (P = 0.85, r = -0.14) \). Median cord blood triglyceride level in cesarean section and vaginal delivery were 72 and 75 mg/dl respectively which there was not statistically significant difference \( (P = 0.64) \). Median cord blood triglyceride level in unwanted pregnancies was 76 mg/dl and in previous planned pregnancies was 74 mg/dl which there was not statistically meaningful difference \( (P = 0.96) \).

DISCUSSION
In our study 8.6% of newborn infants had hypertriglyceridemia as regards to 95\textsuperscript{th} percentile of triglyceride in cord blood of Iranian newborn infants in Klishadi’s report,\cite{9} and 33.9% of our samples (33% girls and 35.1% boys) had triglyceride level higher than 95\textsuperscript{th} percentile of Nelson textbook of pediatrics.\cite{25} The 5\textsuperscript{th} percentile of triglyceride level in our study was 41.5 mg/dl which is higher than the Kelishadi’s study (38.2 mg/dl).\cite{9} The mean of cord blood triglyceride in this study was 81.4 mg/dl which is very higher than other reports like Chile 35 mg/dl,\cite{20} Japan 23 mg/dl,\cite{29} America 35.8 mg/dl,\cite{30} Poland 56.5 mg/dl,\cite{31} and Canada 39.6 mg/dl and but just nearly consistent with reports of Kelishadi\cite{9} and Vaziri\cite{16} in Iran. Recently, vitamin D deficiency has been suggested as a possible dietary risk factor for dyslipidemia.\cite{34} Some studies have shown that the serum level of vitamin D has inverse relationship to blood triglyceride level, perhaps because vitamin D can increase the activity of lipoprotein lipase in the adipocyte.\cite{34,35} Kazemi has reported relatively high frequency of vitamin D deficiency in Iranian newborns.\cite{36} So the high newborn triglyceride level in this study maybe due to vitamin D deficiency. The Spearman correlation coefficient test did not show linear relationship between triglyceride and weight, head circumference, height and BMI. In one study in Taiwan on 3 groups of newborn infants with normal, low and high birth weight, cord blood triglyceride was reduced with increasing birth weight,\cite{37} but in our study there was not a linear relationship between triglyceride level and increasing birth weight [Figure 1]. Mean and 50\textsuperscript{th} percentile of cord blood triglyceride in two sexes had not statistically significant differences which are consistent with some studies.\cite{9,15} But in some articles its level in female is higher than males\cite{17,18} and in other reports its level in males is higher than female.\cite{19,20,38} Çipran from Turkey reported that the triglyceride level in the cord blood in vaginal delivery is higher than cesarean,\cite{39} but in our study there is no differences between two type of delivery, which is consist with Yoshimitsu report.\cite{40} We find a negative correlation between triglyceride level and maternal age, this means that with increasing mother’s age, triglyceride level of umbilical cord have been reduced. It is different from the study of Kelishadi\cite{9} and kharb.\cite{41} In our study there was no correlation between triglyceride level and gestational age \( (P = 0.85, r = -0.14) \). Median cord blood triglyceride level in unwanted pregnancies was 76 mg/dl and in previous planned pregnancies it was 74 mg/dl which was not statistically meaningful difference \( (P = 0.96) \).

CONCLUSION
The mean triglycerides of cord blood in this study and other reports from Iran\cite{9,16} are very high, On the other hand, blood lipid disorders\cite{6,7} and metabolic syndrome are common in Iran.\cite{5,42} We recommend that larger studies should be conducted in this area to establish preventive ways for increasing epidemic of the metabolic syndrome.

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