Original Research Article

Profile of cord blood lipids in term newborns in parakou (Benin)

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A R T I C L E   I N F O

A B S T R A C T

Introduction: Lipid profile abnormalities at birth indicate that initial genetic inheritance is already at risk of developing a cardiovascular disease.

Objective: Investigate the profile of umbilical cord blood lipids of term newborns in Parakou (Benin).

Materials and Methods: This research work was a cross-sectional study with descriptive and analytical purpose, based on prospective collection of data. It involved term newborns recruited through complete census in three health-care facilities located in the city of Parakou (Republic of Benin), after the informed consent read and approved by their respective mothers and ethics advice. The study data were collected from March 1 to May 30, 2017 by measurements of anthropometric and lipid parameters from umbilical cord blood using endpoint enzymatic methods. LDL cholesterol was obtained by Friedewald formula.

Results: A total of 120 newborns were recruited (60 males and 60 females). Their mean weight was estimated at 2992.68 ± 355.08 g with extremes from 2120 to 3125 g. The mean values of lipid parameters were: total cholesterol (0.68 ± 0.25 g/L), HDL cholesterol (0.29 ± 0.12 g/L), LDL cholesterol (0.31 ± 0.16 g/L) and triglyceride (0.39 ± 0.27 g/L). There was no significant difference in mean values of newborns' lipid parameters between both sexes ($p > 0.05$). Total cholesterol and HDL cholesterol were normal, respectively in 75.83% and 85% of cases; hypotriglyceridemia was observed in 61.67% of newborns.

1. Introduction

Cardiovascular diseases (CVD) are on the rise in the world population with increasingly younger ages of occurrence. They represent a serious public health concern and are currently the leading cause of mortality across the world. In fact, more than 15 million deaths related to cardiovascular diseases are recorded each year worldwide; more than three fourths of them occur in low or middle income countries, including those of Africa.[1]

The causes of that problem are not well known but they involve some risk factors like heredity, hyperlipidemia, high blood pressure, sedentary lifestyle, tobacco addiction, obesity and diabetes mellitus which account for 75% in the occurrence of those CVD.[1] Hyperlipidemia is a major risk factor for CVD. Metabolic disorder of cholesterol, major component of serum lipids, results in formation of atheroma plaques with progression towards atheromatous lesion which is the main source of CVD.[2,3]

Lipid profile abnormalities at birth indicate that initial genetic inheritance is already at risk of developing a CVD.[4] For instance, newborn genetic inheritance at birth mentioned by Hales et al.[5] for the first time in 1991 would significantly determine the occurrence of CVD. Studies have shown that serum cholesterol level in adult is associated with stunted growth in late pregnancy.[6]

There are controversies about many studies conducted on newborns' cord blood lipid profile. Vaziri Esfarjani et al.[7] reported an increase in total cholesterol, HDL cholesterol and triglycerides and a decline in HDL cholesterol compared to reference values among Iranian term newborns

. For Alinaghi Kazemi and Sadeghzadeh.[8] there was a relative increase in triglycerides ' total cholesterol among Iranian term newborns. Increased total cholesterol and HDL cholesterol have been observed by Pardo et al.[9] in Brazilian near-term newborns. Besides, there is a difference in cord blood lipoproteins between black race and white race as well as between both sexes.[10]

In Africa, although CVD are increasing, there is practically no works on the genesis of their risk factors, especially hypercholesterolemia in neonatal period and during childhood. Only the study of Yapo et al.[11] in Côte d'Ivoire has mentioned the normal biochemical profile of reference of the Ivoirian child from 0 to 15.

This study aimed to investigate the cord blood lipid profile of term newborns in Parakou (Benin).

2. Materials and Methods

2.1. Study setting

Newborns were selected in the following settings: Gynecology & Obstetrics Unit of the Borgou/Alibori Regional University Teaching Hospital (CHUD-B/A), maternities of the District Health Centre and Kpébié Health Centre in Parakou (Republic of Benin). The Biochemistry laboratory of CHUD-B/A hosted the handling of biological samples.

2.2. Type and period of study

This research work was a cross-sectional and descriptive study with analytical purpose, based on prospective collection of data. It was carried out over a 3-month period i.e. from March 1 to May 30, 2017.

2.3. Study population and sampling

The study population consisted of all term live births.

The complete census included all the newborns meeting the inclusion criteria and who were registered during the study period, after informed consent read and approved by their respective mothers.

2.4. This study included all the term newborns:

1. Born from normal monofetal pregnancies, delivered by vaginal birth, and with an APGAR score above seven (07) at first minute of life;
2. Born to non-hypertensive, non-diabetic and tobacco non-addict mothers who have no history of dyslipidemia, or who are not taking medications other than those indicated during a normal pregnancy.

2.5. This same study did not include term newborns born to pregnant women:

1. Who did not give their free and informed consent;

2. Presenting with a disability which does not enable to answer questions (deafness, dumbness...).

2.6. Variables

They consisted of variables related to cord blood lipid profile and those related to newborns' anthropometric parameters.

2.7. Data collection

Mothers' informed consent was obtained further to reading and explanation of study objective. Immediately after childbirth, newborn examination was performed in accordance with our selection criteria; then, a 4mL blood sample was collected from cord umbilical vein into dried tubes, and brought to the CHUD-B/A biochemistry laboratory.

2.8. Measurement of lipid parameters

The collected blood samples were centrifuged at 4000 revolutions per minute (rpm) during 5 minutes, and then serums were decanted. Decanted serums were used on the same day to measure lipid parameters.

On each blood sample, the following measurements were performed: total cholesterol using cholesterol oxidase method,[12] HDL cholesterol by precipitation with phosphotungstic acid in the presence of magnesium ions,[13] triglycerides by glycerol phosphate oxidase method.[14] LDL cholesterol was estimated by calculation using the formula of Friedwald et al.[15] if triglycerides do not exceed 3.4 g/L.

Variation in lipid profile was determined using usual values proposed by Bingen et al.[16]

2.9. Data analysis

After their gathering, the data were analyzed and processed with the software Epi Info 7.2.0.1. The quantitative variables were expressed as averages with standard deviation and qualitative variables as proportions or ratios. Graphs were drawn using Excel 2007. Mean values were compared using Student's test at 5% threshold.

2.10. Ethical considerations

This study protocol has been approved by the Local Committee for Biomedical Research of the University of Parakou (Decision notice No. 0011/CLERB-UP/P/SP/R/SA). Moreover, the Regional Directorate of Health for Borgou/Alibori has authorized it under No. 0148/16/MS/RB/DDS-B/A/ZS-PN/BC/SA. We also got the informed, read and approved consent of mothers of infants included in this study.

3. Results

General characteristics of newborns

This research work focused on 120 term newborns, including 60 male and 60 female. Table 1 shows newborns' anthropometric parameters.

Cord blood lipid profile of newborns at birth

The statistical distribution parameters of lipid parameter values of term newborns' cord blood are indicated in.Table 2

The comparison of male newborns' lipid parameters with female ones did not point out any significant difference (P > 0,05) (Table 3).

The comparison of lipid parameter values of studied newborns with references values enabled to note a normal level of total cholesterol and HDL cholesterol respectively in 75.83% and 85% of cases. On the contrary, 74 cases of hypotriglyceridemia were observed i.e. 61.67%. Those fin dings are illustrated in. Figure 1
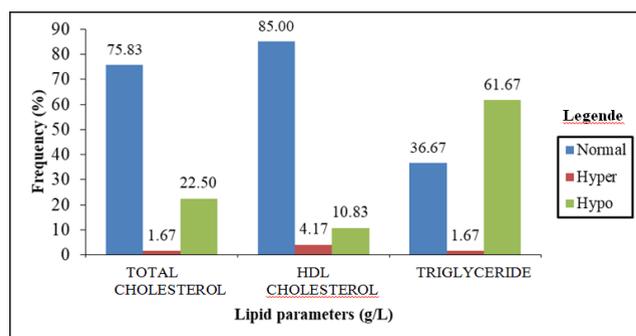
Fig. 1: Variation in total cholesterol total, HDL cholesterol and triglyceride of term newborns ' cord blood, Parakou, March-May 2017. (N= 120)

4. Discussion

In this study, mean total cholesterolemia among newborns was 0.68 ± 0.25 g/L. This resut is comparable to the findings of Nazeer et al. [17] in India in 2015 who found out 0. 62 $\pm$ 0.07 g/L, those of Sreekarthik et al. [18] in India in 2015 who noted 0.64 ± 0.26 g/L, the ones of Alinaghi Kazemi and Sadeghzadeh [8] in Iran in 2014 who reported a value of 0.73 $\pm$ 0.26g/L, and Vaziri Esfarjani et al. [7] who found in Iran in 2013 a value estimated at 0.81 ± 0.19 g/L. In contrast, it is lower than the one of Kwaeri et al. [19] in Iraq in 2007 who reported a mean value of 2.12 ± 0.51 g/L . It may be inferred from those findings that the mean value of total cholesterol in Benin melanoderm newborns is similar to the one of Indo-Iranian newborns .

The mean value of HDL cholesterol found in this study (0.29 ± 0.12 g/L) is identical to values reported in many studies among newborns: in Iraq in 2007, Kwaeri et al. [19] found out a mean value of 0.30 ± 0.02 g/L ; in India in 2015, Nazeer et al. [17] reported 0.25 ± 0.03 g/L ; in India in

2015, Sreekarthik et al. [19] noted 0.27 ± 0.08 g/L ; in Iran, Alinaghi Kazemi and Sadeghzadeh [8] found in 2014 a mean value estimated at 0.27 ± 0.10 g/L ; in 2013, Vaziri Esfarjani et al. [7] found out in Iran 0.25 ± 0.07 g/L. Those observations seem to prove once more that HDL cholesterolemia of Benin melanoderm newborns is in the same range of values as the one of Indo-Iranian newborns .

Mean LDL cholesterolemia of newborns found in this study was estimated at 0.31 ± 0.16 g/L. This result is similar to those of Nazeer et al. [17] who found in 2015 in India 0. 24 $\pm$ 0.07 g/L; the one of Alinaghi Kazemi and Sadeghzadeh [8] who found in 2014 in Iran 0.28 ± 0.11 g/L. It is also similar to the one of Sreekarthik et al. [18] who reported in 2015 in India 0.29 ± 0.12 g/L. On the contrary, our result is lower than those reported by Vaziri Esfarjani et al. [7] in 2013 in Iran i.e. 0.48 ± 0.16 g/ L, and the one found in Iraq in 2007 by Kwaeri et al. [19] i.e. 1.00 ± 0.12 g/L. Such variations may be due to the probable influence of genetic and environmental factors on lipid profile.

The mean value of newborns' triglyceride found out in this research work (0.39 ± 0.27 g/L) is identical with the values identified by Vaziri Esfarjani et al. [7] in 2013 in Iran (0.42 ± 0.29 g/L), the ones found by Sreekarthik et al. [18] in India in 2015 (0.47 ± 0.16 g/L) and those reported by Nazeer et al. [17] in India in 2015 (0.59 ± 0.07 g/L). On the contrary, higher values have been reported by Alinaghi Kazemi and Sadeghzadeh [8] in Iran in 2014 (0.81 ± 0.37 g/L) and by Kwaeri et al. [19] in Iraq in 2007 (1.05 ± 0.18 g/L).

This study has highlighted that there is no statistically significant association between newborns ' sex and cord blood lipid parameters (p > 0.05). The same observation was made by Aletayeb et al. [20] in Iran in 2013, Ghiasi et al. [21] in India in 2013 and Kharb et al. [22] in India in 2010. On the contrary, there is a discrepancy between our result and the one of other authors published in the literature. In Iran in 2007, Kelishadi et al. [23] found out that total cholesterol and HDL cholesterol were significantly elevated in the group of girls. For Sreekarthik et al. [18] in India in 2015, only HDL cholesterol was significantly higher in female newborns. In Iran in 2008, Badiee and Kelishadi [24] reported that the levels of total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides in girls were significantly more elevated than in boys. Those different studies indicate that despite the research works of Loughrey et al. [10] on racial and sex difference in cord blood lipoproteins, the close relationship between newborns' cord blood lipid profile and sex still has to be investigated.

The only limitation of this study is the small size of the sample investigated. However, as lipid parameters ' values have been determined in apparently healthy term newborns, they may serve as reference value in the future.

Table 1: Anthropometric parameters of term newborns , Parakou, March-May 2017 (N= 120)

	Mean value	Standard deviation	Min	Max
Weight (g)	2992.68	355.08	2120	3825
Height (cm)	49.57	1.24	47	52
Head circumference (cm)	33.56	1.28	31	36
Waist circumference (cm)	32.08	1.20	29	35

Table 2: Statistical distribution parameters of lipid parameter values (in g/L) of term newborns ' cord blood, Parakou, March-May 2017 (N= 120)

	Mean value	Standard deviation	Min	Max
Total cholesterol	0.68	0.25	0.31	1.85
LDL cholesterol	0.31	0.16	0.09	1.09
HDL cholesterol	0.29	0.12	0.10	0.72
Triglycerides	0.39	0.27	0.10	1.72

Table 3: Lipid parameters (g/L) of term newborns according to sex, Parakou, March-May 2017 (N= 120)

	Male (n = 60)	Female (n = 60)	P
Total cholesterol	0.66±0.21	0.70±0.29	0.3113
LDL cholesterol	0.31±0.14	0.32±0.18	0.6124
HDL cholesterol	0.28±0.10	0.30±0.13	0.2735
Triglycerides	0.38±0.23	0.40±0.31	0.5730

5. Conclusion

Melanoderm term newborn from Benin is probably characterized by hypotriglyceridemia. The findings of this study thus show that melanoderm term newborn with normal weight may be less exposed to cardiovascular diseases due to his genetic inheritance and intra-uterine environment. Further studies based on larger samples are necessary to confirm that observation and make an-depth analysis of the involvement of cord blood lipids of melanoderm newborn as a risk factor for early occurrence of cardiovascular diseases.

6. Conflicts of interest

The authors certify that they have NO affiliation with organizations or entities with interest of any kind (political, ideological, religious, financial or non-financial) in the subject matter or materials discussed in this manuscript.

6.1. Authors' contribution

This work was carried out in collaboration between all authors. **MG** : Study conception and design, drafting of paper manuscript; **AO** : supervision of data collection, statistical analysis and interpretation of data; **GA** : data collection and literature review; **TS:** literature review; **SA:** Study validation and manuscript revision. All authors read and approved the final manuscript.

6.2. Acknowledgments

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