

# **CORD BLOOD LIPID HETEROGENEITY AND NEONATAL ANTHROPOMETRY**

**Thesis**

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**List of Abbreviations**

<b>ACTH</b> .....	Adrenocorticotropic hormone
<b>AGA</b> .....	Appropriate for gestational age
<b>BMI</b> .....	Body mass index
<b>CE</b> .....	Cholesterol esters
<b>CH</b> .....	Cholesterol
<b>CHD</b> .....	Coronary heart disease
<b>cm</b> .....	Centimeters
<b>CNS</b> .....	Central nervous system
<b>CVD</b> .....	Cardiovascular diseases
<b>dl</b> .....	deciliter
<b>E2</b> .....	Estradiol
<b>ELBE</b> .....	Extremely low birth weight
<b>FELIC</b> .....	Fate of early lesions in children
<b>GH</b> .....	Growth hormone
<b>gm</b> .....	Gram
<b>HDLC</b> .....	High low density lipoprotein cholesterol
<b>HDL-R</b> .....	High low density lipoprotein receptor
<b>HDL-SM</b> .....	High density lipoprotein-sphingomyelin
<b>IDL</b> .....	Intermediate density lipoproteins
<b>IGF-1</b> .....	Insulin like growth factor-1
<b>IHD</b> .....	Ischemic heart diseases
<b>IMT</b> .....	Intima-media thickness
<b>IUGR</b> .....	Intrauterine growth retardation

**List of Abbreviations<sub>(Cont...)</sub>**

<b>Kcal</b> .....	Kilo calories
<b>Kg</b> .....	Kilograms
<b>L</b> .....	Length
<b>LBW</b> .....	Low birth weight
<b>LCAT</b> .....	Lecithin-cholesterol acyltransferase
<b>LDL</b> .....	Low density lipoprotein
<b>LDLC</b> .....	Low density lipoprotein cholesterol
<b>LDL-R</b> .....	Low density lipoprotein receptor
<b>LGA</b> .....	Large for gestational age
<b>LPL</b> .....	Lipoprotein lipase
<b>m</b> .....	Meters
<b>MDA</b> .....	Mediterranean diet adherence
<b>MEN</b> .....	Multiple endocrine neoplasia
<b>mg</b> .....	Milligrams
<b>mm</b> .....	Millimeters millimeters
<b>PCSK9</b> .....	Proprotein convertase subtilisin/kexine type 9
<b>PE</b> .....	Preeclampsia
<b>SD</b> .....	Standard deviation
<b>SGA</b> .....	Small for gestational age
<b>SHS</b> .....	Second hand smoke
<b>TBF</b> .....	Total body fat
<b>TC</b> .....	Total plasma cholesterol
<b>TG</b> .....	Triglycerides

List of Abbreviations<sub>(Cont...)</sub>

<b>TS</b> .....	Tricipital skinfold
<b>VLBE</b> .....	Very low birth weight
<b>VLDL</b> .....	Very low density lipoprotein
<b>W</b> .....	Weight
<b>Wk.</b> .....	week

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## INTRODUCTION

Several maternal and fetal factors, such as hypertension, diabetes, obesity, and low or high birth weight, can influence fetal plasma lipids(*Kherkeulidze et al., 2004*).

Low birth weight (LBW) is associated with increased incidence of CVD, hypertension, and type II diabetes(*Baker et al., 1993*).

Changes in blood lipids in LBW newborns with relative insulin intolerance can increase the risk of CVD in adulthood. LBW is a risk of later atherosclerotic diseases that is equal to smoking or hypertension at puberty(*Mi et al., 2000*).

On the other hand, high birth weight is associated with increased insulin-like growth factor-1 (IGF-1) that could change lipoprotein composition and concentration at birth, and could increase the risk of CVD(*Lombardi et al., 1997*).

The cord blood lipid profile may be associated with lifelong changes in the metabolic functions of the individual(*Kelishadi, 2007*).

The correlation of cord blood lipid profile in neonates with their anthropometric data and their predictive role as

markers for adulthood diseases is still not completely explored(*Nayak et al., 2013*).

Among children, Levels of lipids are strongly related to subscapular and triceps skinfold thicknesses. Adverse levels of cardiovascular disease risk factors and dyslipidemia are associated with specific estimates of body fatness obtained from skinfold thicknesses(*Steinberger et al., 2005*).

In the present study we hypothesized that high levels of lipids in cord blood might also be correlated with the neonatal anthropometric measurements, as the case in children, and accordingly those anthropometric measurements could be considered an easy non invasive way in neonates to predict dyslipidemia and cardiovascular diseases in their adulthood and so take preventive measures as early as possible.

## AIM OF THE STUDY

*The primary aim* of this work is to study cord blood lipid profile and its relation to neonatal anthropometry.

*The secondary aim* is to detect the influence of maternal obesity and maternal age on cord blood lipid profile.

# CORD BLOOD LIPOPROTEINS AND PRENATAL INFLUENCES

## **1.The composition of cord lipids:**

The concentration of lipids in cord blood serum is considerably lower than that found in adults. Cord total cholesterol (TC) is 68 mg/dl (*Neal, 2007*) which is approximately one-third (33–38.2%) that of adult levels (*Nagasaka et al., 2002*), LDL is 29 mg/dl (*Neal, 2007*) which is also one third (31.9%) of adult levels (*Nagasaka et al., 2002*), while HDL and triglycerides are 35 mg/dl, 34 mg/dl respectively (*Neal, 2007*) which is about half (50.5% and 46.2%, respectively) of adult levels. VLDL is also present at lower concentrations (*Nagasaka et al., 2002*).

The majority of neonatal cholesterol is carried by HDL particles and makes up 44% of the total lipoproteins in cord serum, compared with 14% and 40% for VLDL and LDL, respectively. Thus, in contrast to adults, total cholesterol in newborns is highly correlated with both HDL and LDL and distributed almost equally between them (*Peticca et al., 2013*). This low LDL: HDL ratio has been attributed in part to a reduced transfer of esterified cholesterol from HDL to other lipoproteins, and the decline in LDL near term to increased LDL utilization by fetal adrenals. However, there does not seem to be

a generalized increase in LDL receptor activity towards late gestation(*Bastida et al., 1996; Loughrey et al., 2000*).

LDL composition is richer in triglycerides and poorer in cholesterol esters compared with that of adults, whereas HDL composition is similar to that in adult blood. Some studies have reported VLDL in cord blood to be significantly richer in cholesterol esters and poorer in triglycerides compared with adults(*Bansal et al., 2005*).

Every apolipoprotein apart from apoE has been reported to be lower in cord than adult serum, with apoB and apoD most reduced, apoB between 25 and 31% and apoD 37% of adult levels. ApoAII and apoCIII are thought to be 49% and 45% of adult values, respectively, while apoAI and apoCII are closer to adult levels (63.4% and 73.3%)(*Averna et al., 1991*).

ApoE concentrations are similar to adult values, but in contrast to adults, more than 80% of apoE is associated with HDL]. This is compatible with HDL providing a source of cholesterol for growing tissues, the apoE rich HDL being taken up by LDL receptors, a situation not unlike that in many adult mammalian species in which HDL remains the dominant circulating lipoprotein. Interestingly, this situation persists in the human nervous system in adulthood (*Bansal et al., 2005*).