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Serum Lipid Profiles – A predisposing Factor to cardiovascular disease among Pregnant Women in Benin City and Sapele Metropolis

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Abstract

During pregnancy, a woman undergoes dramatic physiological hormonal and biochemical changes which alters the maternal metabolism in order to satisfy the aliments of the developing foetus in addition to the energy requirement of the mother. These changes may be evident in the maternal lipid profile. However, there is paucity of information to confirm or otherwise of this assertion. The aim of this study was to document the lipid profile of pregnant women living in Benin City in Edo State and Sapele environs in Delta state, both in South-South zone of Nigeria. Subjects for this study included 150 pregnant women (aged 20 to 46 years with mean age 33 ± 0.0 years) who were in different stages of pregnancy. Fifty non-pregnant, non-lactating, apparently healthy women were used as controls. Serum samples were analysed for lipid profile using standard methods. Results showed a statistically significant difference ($p < 0.001$) in the levels of TC, HDL-C, LDL-C and triglycerides in all the trimesters. There was no significant difference ($p > 0.05$) in VLDL-C in the groups. Moreover, no significant difference ($p > 0.05$) was observed when the atherogenic indices (ratio of TC to HDL-C) was compared for the two groups. This implies that increase in lipid profile of pregnant

women living in Benin City and Sapele does not predispose them to cardiovascular disease.

Keywords: Lipid profile, pregnancy, cardiovascular disease

Introduction

Pregnancy is the commonly used to describe gestation in humans. It describes development of an embryo or foetus in the uterus. When one or more embryo or foetus is developing in a single pregnancy, it is known as multiple pregnancy for example twins. The duration of normal pregnancy is calculated from the start of the last normal menstrual period (LNMP) and it is approximately 40 weeks (Tietz, 1998).

The first 8 weeks following conception, there is rapid development of the embryo and the term foetus is used to describe the developing offspring until birth. Human pregnancy can be broadly separated into three parts of about three months each called trimesters (Liberto, 2012). This is needful to serve as a means to simply refer to the different stages involved in prenatal development. The highest risk of miscarriage is noticed in the first trimester as there could be natural death or abortion of embryo or foetus. The viability, growth and development of the



foetus can more easily be monitored in the second trimester. Further growth and development of foetal fat stores marks the period of the third trimester (Alkozei *et al.*, 2014).

The plasma lipids are the triglycerides, free and esterified cholesterol, phospholipids (lecithin and shingomyelin) and the free or non-esterified fatty acids. Fatty acids can be classified on the bases of length of the carbon chain, the number of double bonds, saturated, mono and poly unsaturated (Kannol, 1987). Lipids are vital constituent of membrane structures, not only because they form a water barrier but also by the nature of their structural interaction with other membrane molecule (Burger *et al.*, 2002).

Normal pregnancy is generally calculated from the first day of a woman's last normal menstrual period. The resulting foetal age is called gestational age. In invitro fertilization gestational age is calculated by days from Oocyst retrieval x 14 days. At the start of the preceding menstrual period the female reproductive organs undergo changes to prepare for an upcoming conception. There is an increase in follicle stimulating hormone that stimulates the production of follicles or folliculogenesis and then Oogenesis so as to produce mature egg cell which is the female gamete. When the male gamete of spermatozoa fuses with the mature egg cell, fertilization takes place (Tunon *et al.*, 2000). The aim of this research was to estimate the lipid profile of pregnant women living in Benin City and Sapele environs and to ascertain if they constitute predisposing factors to causation of cardiovascular diseases in pregnant women in Benin City and Sapele Metropolis

Materials and Method

Area of Study

Subjects for this study included pregnant women living Benin City and Sapele, Delta State. Non-pregnant women attending Central hospital in Sapele constituted the controls. Benin City is the capital of Edo State in Southern Nigeria and has a population of about

1,200,000. The city is approximately 40 kilometres north of the Benin river and about 320 kilometres by road east of Lagos State. The main industry is Rubber and Timber processing. It also has a large traditional industry of palm oil and palm nuts processing (Bendel MoI, 1978). Delta State which was formed from the former Bendel State on August 27th 1991, covers a land mass of about 18,050km² of which more than 60% is land. The state lies between longitude 5°00 and 6°45' East latitude 5°00 and 6°50 North. At the North, it is bounded by Edo state, at the East by Anambra State, South East by Bayelsa State and on the North flank is Benin. It has a population of about 4,098,291 (men: 2,674,306; Female 2,024,085) (MoI, 1978). Delta State has twenty-five local government areas including Sapele local government area. Sapele is one of the cities in Delta State of Nigeria. It is occupied mainly by the Urhobo and Okpe speaking people. The city has a population of 142,652. Its commerce and industrials include the timber processing, palm oil, rubber and furniture making. Their major local food is starch and owo soup.

Sampling

A total of 200 pregnant women between the ages of 20 and 46 years living in Benin City and Sapele metropolis were enrolled into this study. One hundred and fifty pregnant women at different stages of pregnancy (50 women in their first trimester, 50 women in their second trimester and 50 women in their third trimester) constituted the subjects for this study. Fifty non-pregnant, non-lactating, apparently healthy women were included as controls for this study.

Sample Collection

Five (5) ml of venous blood was collected from each participant after overnight fast into plain subject container. Samples was allowed to clot and centrifuged to obtain serum that was analysed immediately for lipid profile.

Method of Assay

Total Cholesterol estimation was carried out using the Modified methods (Ailain., 1974; Fredrickson *et al.*, 1967).

Statistical Analysis

The statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 16. Analysis of the results was carried out using the one-way analysis of variance (ANOVA) and student t-test. A p-value of ≤ 0.05 was considered significant in all statistical analysis carried out.

Results

Subjects for this study included 150 pregnant women (aged 20 to 46 years with mean age 33 ± 0.0 years) who were in different stages of

pregnancy. Fifty non-pregnant, non-lactating, apparently healthy women were used as controls. Table 1 shows the mean \pm SD serum lipid profile of pregnant women in their different trimesters and non-pregnant women. The TC, HDL-C, LDL-C and TG values were significantly higher ($p < 0.001$) in all the trimesters of pregnancy than in non-pregnant (control) women. No significant difference ($p > 0.05$) was observed in VLDL-C levels in all groups. Figure 1, 2,3,4 and 5 shows the bar chart indicating the comparison of the different trimester for T. Cholesterol, HDL-C, LDL-C, TRIG and VLDL respectively.

Table 1: Lipid profile among pregnant women in the trimesters with control group

Parameters	First Trimester	Second Trimester	Third Trimester	Control	p-value
T. CHOL	4.815 ^c \pm 0.064	5.230 ^a \pm 0.113	5.558 ^b \pm 0.111	3.691 ^d \pm 0.051	<0.001
HDL-C	1.492 ^c \pm 0.024	1.618 ^b \pm 0.036	1.755 ^a \pm 0.042	1.372 ^d \pm 0.019	<0.001
LDL-C	2.585 ^b \pm 0.049	2.839 ^a \pm 0.079	2.940 ^a \pm 0.075	1.595 ^c \pm 0.041	<0.001
TRIG	1.527 ^b \pm 0.039	1.678 ^a \pm 0.041	1.745 ^a \pm 0.055	1.713 ^a \pm 0.021	<0.01
VLDL	0.358 \pm 0.055	0.355 \pm 0.008	0.349 \pm 0.009	0.339 \pm 0.004	>0.05

Key: Significant $p < 0.05$, Non-significant; $p > 0.05$. Values are expressed as mean \pm S.E.M

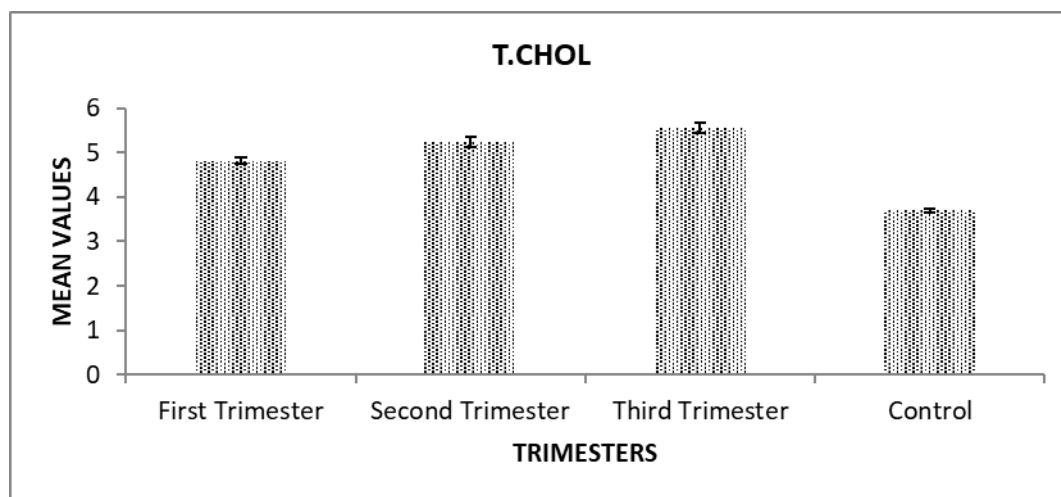


Figure 1: Bar chart showing the comparison of the different trimester for T. Cholesterol

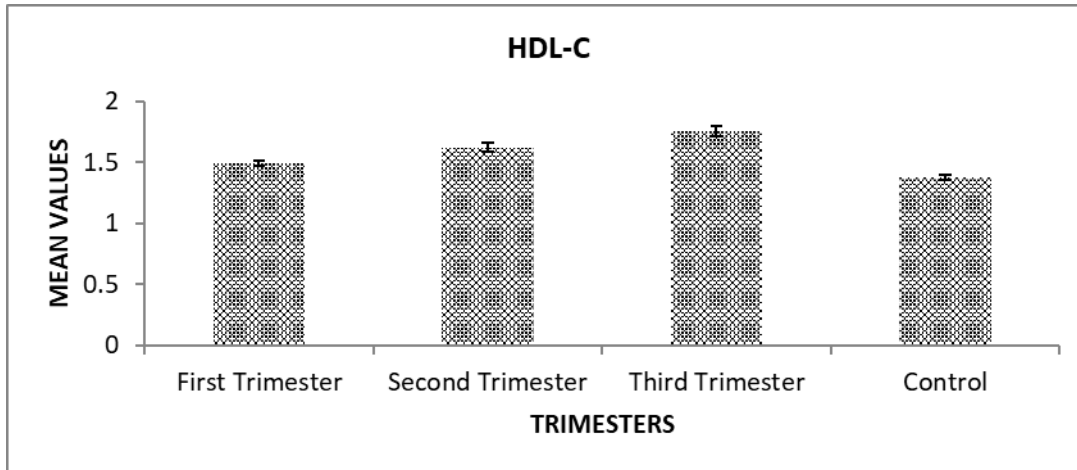


Figure 2: Bar chart showing the comparison of the different trimester for HDL-C

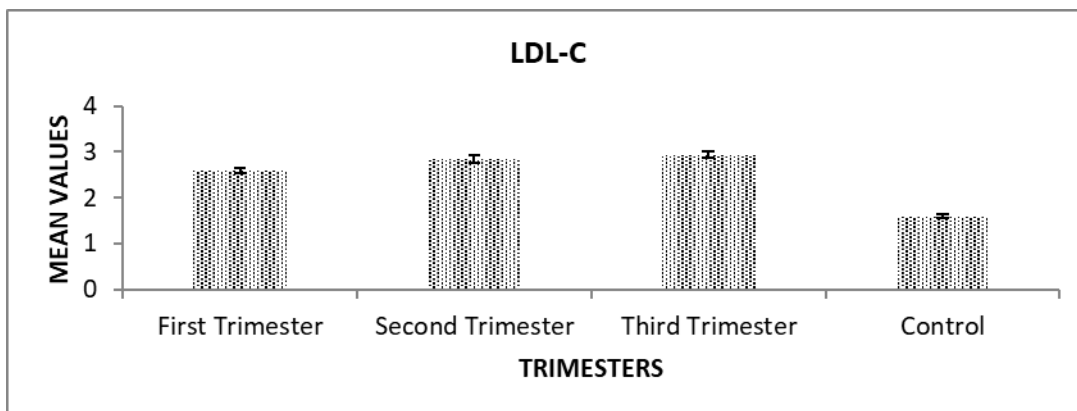


Figure 3: Bar chart showing the comparison of the different trimester for LDL-C

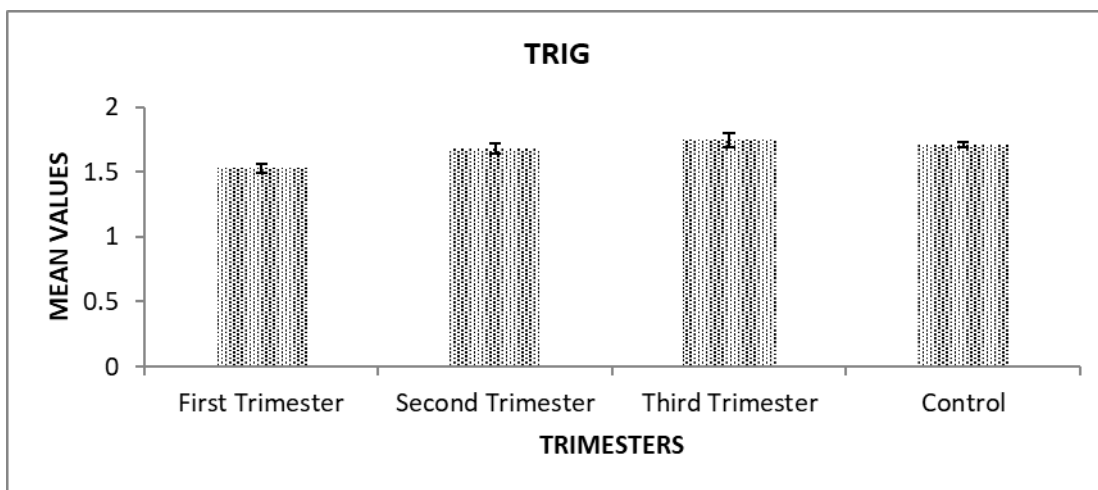


Figure 4: Bar chart showing the comparison of the different trimester for TRIG

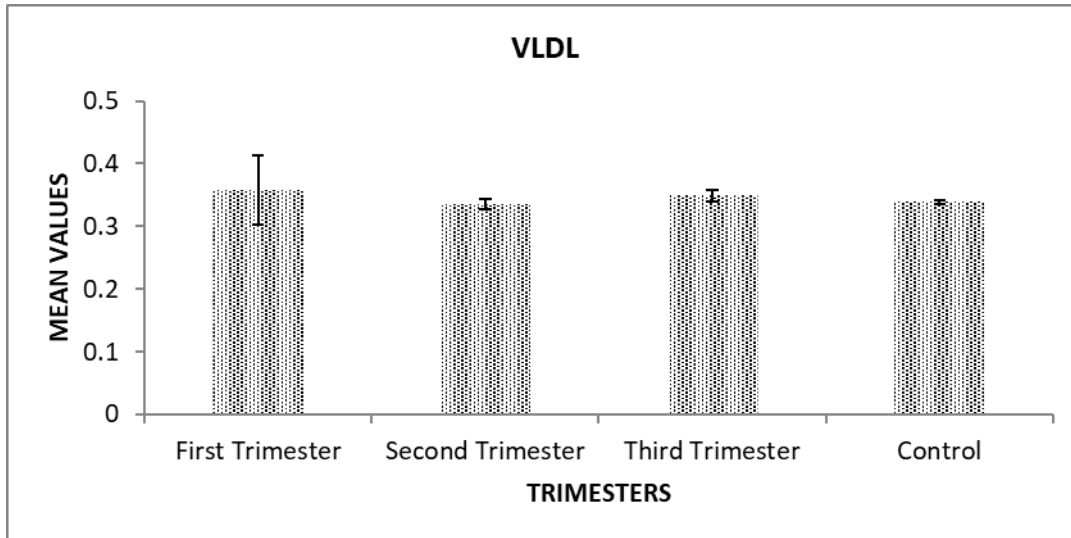


Figure 5: Bar chart showing the comparison of the different trimester for VLDL

Discussion/ Conclusion

From this study, we observe that there were alterations in the serum levels of lipid and lipoprotein among pregnant women when compared with non – pregnant women. We found a significantly higher level of T.C ($p < 0.001$), HDL – C ($p < 0.001$) LDL – C ($p < 0.001$) and TG ($p < 0.01$) in the first, second and third trimester. There was however no significant difference in the VLDL – C ($p > 0.05$). Our finding collaborates with the previous report by Udoh *et al.* (2002) which indicated a progressive rise in the level of Serum TC, HDL, LDL and TG at the various stages in pregnancy.

The progressive increase recorded in our study however in this study does not agree with the finding of Butte (2000) who reported an initial decrease in TC and LDL – C concentration in the first trimester, and then increase in the second and third trimesters. Total Cholesterol results of this study agrees with the finding of Adegoke *et al.* (2003) who also reported a continuous significant increase in Total Cholesterol with increase in gestational age. Similarly, Takahashi *et al.* (2008) reported significant increases in the levels of TC, HDL C, LDL – C and TC in all trimesters.

The mean increase in Total Cholesterol from first to the third trimester (0.3711mm/l) was higher than that of TG (0.1093mm/l). This finding is at variance with a previous report by

Herrera *et al.* (2004) who reported significant increases in the level of the maternal plasma Total Cholesterol and Triglycerides from the first to the third trimester of pregnancy with the change in Triglycerides being greater than that for Total Cholesterol.

The cardiac risk factor of TC: HDL ratio was calculated for the three trimesters as a predictor of atherosclerosis in pregnant women. We observed a decrease from second to third trimester. Our finding is in agreement with a previous report by Neboh *et al.* (2012). Our finding is also in agreement with the findings of Dej-Mukhopadhyay *et al.* (2006) who reported a decline in TC: HDL during pregnancy. In addition to the relevance of TC: HDL as a predictor of atherosclerosis, the significance of altered TC: HDL ratio indicates additional risks in pregnancy induced hypertension (PIH).

In this study, we observed an increase in the concentration of all the lipid fractions. Our finding is at variance with a previous reports (Dej-Mukhopadhyay *et al.*, 2006; Wilkler *et al.*, 2000) who reported an association between increase in plasma triglycerides concentration, small dense LDL and decreased HDL – C. Elevated TG levels present in the first trimester due to hyperestrogenemia may be responsible for the increase in the level of LDL seen in the early stage of pregnancy (Wilkler *et al.*, 2000).



The results observed in this research are compatible with well-established reduction of hepatic TG lipase activity during pregnancy. The changes are related to the cause of hyperlipidemia and cholestasis of pregnancy. The decrease in TC: HDL ratio of the pregnant woman can be attributed to the diet and less sedentary professions of the woman such as farming, trading and hawking which predisposes, them to increased activity and possible protection from abnormal lipid profile. Finally, the study does not support the idea that normal pregnancy may still put women at risk of vascular damage as previously thought. The corresponding increase in HDL alongside other lipid fractions significantly reduces the cardiac risk factor (TC: HDL). Findings from this study may be an indication that pregnant women living in Benin City and Sapele environ are in fact protected from the risk of atherosclerosis as gestational age advances.

Recommendation

We therefore recommend that pregnant women should eat balanced diet consisting of moderate carbohydrate in which unsaturated fat is substituted for saturated fat. More extensive studies on the serum lipid profile of pregnant women in other parts of Nigeria should be carried out.

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