



Estimation of Serum Cholesterol in Sudanese Pregnant Ladies during Third Gestational Period

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ABSTRACT

This study aimed to determine cholesterol serum levels among pregnant Sudanese women during their third gestational period. In this cross-sectional study, samples were collected from pregnant ladies during the period of September 2012 to April, 2013. The serum concentration of cholesterol was estimated in 120 cases and in a control group of 240 non pregnant women matched on the reproductive age. Cholesterol in serum samples was measured by enzymatic colorimetric technique, using commercially available test kits. Obtained data were analyzed using the statistical packages of social studies (SPSS), program for windows version 16, using student-'t' test. Results were compared as mean and standard deviation and considered significant when ($P < 0.05$). In this study pregnant ladies were having mean cholesterol serum level greater than controls (6.5 ± 0.8 mmol/L, and 4.3 ± 0.9 mmol/L), respectively, (P value = 0.477). About 40% of pregnant ladies were having cholesterol level ≤ 6.5 mmol/L. However, more than 55% of pregnant ladies had cholesterol level > 6.5 mmol/L. This study concluded that higher concentrations of serum cholesterol were more common in pregnant women than control and reaching maximum at weeks 33rd to 36th of the 3rd trimester of pregnancy. The elevation of cholesterol may be a purely physiological response to pregnancy or it may be indicative of pathology in some women.

المستخلص

تهدف هذه الدراسة إلى تقصي مستوى الكولسترول لدى النساء الحوامل في الشهور الثلاث الأخيرة من فترة الحمل. صممت هذه الدراسة لتكون مقطعية عشوائية وجمعت عينات من الدم من النساء الحوامل في الثلث الثالث لفترة الحمل (120عينه) كما وجمعت 240 عينة أخرى من النساء الغير حوامل في سن البلوغ لتمثل عينة المقارنة وذلك خلال الفترة الزمنية من سبتمبر 2012 إلى ابريل 2013 وتم تحليل العينات لمعرفة مستوى

الكولسترول باستخدام الطريقة الإنزيمية enzymatic method والجهاز اللوني colorimeter. تم تحليل النتائج باستخدام برنامج الحاسوب الحزم الإحصائية للدراسات الإنسانية (SPSS)، الإصدار 16، استخدم student-t test لتحليل البيانات للحصول على المتوسط (mean) و الانحراف المعياري (standard deviation) واعتبرت النتائج ذات دلالة إحصائية عند ($P < 0.05$). أظهرت النتائج ارتفاعاً في مستوى كوليسترول الدم لدى النساء الحوامل ($6.5 \pm 0.8 \text{ mmol/L}$) عنه لدى النساء الغير حوامل ($4.3 \pm 0.9 \text{ mmol/L}$) ($P = 0.477$). حوالي 40% من النساء الحوامل وجد أن مستوى الكوليسترول في الدم ($\leq 6.5 \text{ mmol/L}$)، بينما أكثر من 55% من النساء الحوامل وجد أن مستوى الكوليسترول في الدم ($> 6.5 \text{ mmol/L}$). لوحظ هذا الارتفاع في مستوى الكوليسترول خصوصاً في الفترة ما بين الأسبوع الثالث و الثلاثين إلي السادس و الثلاثين من الفترة الزمنية للحمل. خلصت الدراسة إلى أن مستوى الكوليسترول يزداد كلما تقدم زمن الحمل. يفسر هذا الارتفاع بالتجاوب الوظيفي لجسم الحامل مع الحمل أو نتيجة للوضع الاعتلالي لدى بعض النساء الحوامل.

KEYWORDS: Hypercholesterolaemia, Pregnancy induced hypertension, Preeclampsia.

INTRODUCTION

Cholesterol is an unsaturated steroid alcohol of high molecular weight. It is used for the manufacture and repair of cell membrane.^(1,2) Physiologic pregnancy is associated with a broad series of metabolic adaptations which may also influence the metabolism of lipids and lipoproteins.⁽³⁾ High cholesterol levels can cause some risks during pregnancy. Women who had high cholesterol during the gestation period have a heightened risk of preterm birth and may develop pregnancy induced hypertension.⁽⁴⁾ Pregnancy is associated with hypercholesterolaemic state in some ladies with pregnancy-induced hypertension.⁽⁵⁾ All women in normal pregnancy displayed a significant elevation of serum total cholesterol and low density lipoprotein- cholesterol (LDL-C) during parturition.⁽⁶⁾ Women in the third pregnancy showed higher plasma cholesterol concentrations than women in the first pregnancy.⁽⁷⁾ Maternal hypercholesterolaemia during pregnancy associated with enhanced fatty streak formation in human fetuses. It modifies vascular and

placental functions, contributing to complications during pregnancy.⁽⁸⁾ High levels of cholesterol in pregnancy enhance inflammatory responses and peroxynitrite generation in cerebral arteries⁽⁹⁾. Early pregnancy dyslipidemia is associated with an increased risk of preeclampsia.^[10] Preeclampsia shares some metabolic characteristics with coronary artery disease. In the pre-eclamptic women plasma low density lipoprotein cholesterol was increased.^(11,12) Pregnancy induced hypertension (P.I.H) continues to be a major obstetric problem in the present days healthcare practice. At recent times, there has been a great interest on the role of lipid metabolism in the development of pregnancy induced hypertension and preeclampsia⁽¹³⁾

Problem of the study

High cholesterol levels can cause some risks during pregnancy. Women who had high cholesterol during the gestation have a heightened risk of preterm birth and may develop pregnancy induced hypertension.

Although reported cholesterol serum level was to be elevated in pregnancy, it is not routinely measured.

Objective of the study

This study aimed to estimate cholesterol levels among pregnant Sudanese women during their third gestational period, and to correlate the results of cases with controls.

MATERIAL and METHODS

This study was designed as prospective cross-sectional study, carried out in Rabak teaching hospital, obstetrics, gynecology unit, Rabak city, White Nile State, Sudan, during the period September, 2012 – April, 2013. Pregnant and non-pregnant women, aged 15-45 years old whom were randomly selected. One hundred and twenty samples from pregnant and two hundred and forty samples from non-pregnant women have been taken. Pregnant ladies were asked for their age, stage of pregnancy, hypertension or using of any cholesterol lowering medications. A questionnaire was specially designed for this purpose. About 3 milliliters of venous blood sample were taken and were centrifuged at relative centrifugal force (5000rpm) for 5 minutes. Serum was removed by automated pipettes and transferred to plastic container, and stored at (2-8°C). Cholesterol in serum samples was determined by colorimetric technique (Share wood, 252, Germany) using commercially available test kits, enzymatic method. Reagent was obtained from Human Gesellschaft for Biochemica and diagnostica mbH, Germany. Obtained data were analyzed using SPSS program for windows, version 16, using student-'t' test. Results were correlated with each other and also compared as mean and standard

deviation and considered significant when P value is <0.05 .

Quality control

All samples were analyzed as duplicate analysis and the average of each two readings was obtained for quality control purposes.

RESULTS

When compared to the control group (non-pregnant ladies), cases (pregnant ladies) were found to have increased mean cholesterol serum level (6.5 ± 0.8 mmol/L and 4.3 ± 0.9 mmol/L), for cases and control, respectively (table, 1). Mean level of cholesterol of cases was not significantly and negatively correlated with mean level of cholesterol of controls ($P=0.477$) (figure, 1). Table 2, illustrates mean and standard deviation, minimum and maximum cholesterol levels of pregnant women at third period of gestation. Cholesterol level of all cases was significantly correlated with cholesterol level at month 8 of pregnancy ($P<0.01$), and at month 9 of pregnancy ($P<0.01$) and trimester ($P<0.05$). Cholesterol level at month 8 of pregnancy was significantly correlated with cholesterol level at month 9 of pregnancy ($P<0.05$) and trimester ($P<0.01$). All cases were having cholesterol serum level of (>5.2 mmol/L). However, only 13% of controls their cholesterol serum level was (>5.2 mmol/L). Cholesterol level in the range (2.6-5.2 mmol/L) was found in 87% of controls. In this study more than 55% of pregnant ladies in their third trimester were found to have cholesterol serum level (>6.5 mmol/L), about 5% of them their cholesterol level was (>7.8 mmol/L). However, 45% of the pregnant ladies were found to have cholesterol level in the range of (5.2 - 6.4 mmol/L). In this study 57% of

pregnant ladies whom were at 24th - 28th weeks of gestation were found to have cholesterol serum level in the range (5.2 - 6.4mmol/L), and 43% have cholesterol level (>6.4mmol/L). However, about 60% of pregnant ladies at 28th - 32th weeks of gestation were found to have cholesterol serum level from (5.2-6.4mmol/L), and 40%

have cholesterol level (>6.4mmol/L). At the 32nd - 36th weeks of gestation about 37% of pregnant ladies have cholesterol level in the range (5.2-6.4mmol/L), 55% were found to have cholesterol level in the range (6.5-7.8mmol/L), and about 8% of pregnant ladies their cholesterol level was (>7.8mmol/L).

Table 1: Mean ± SD of obtained values of pregnant women and controls.

Variables	Cases (n=120)	Control (n=240)	(P value)
Age (years)	26.2±5.8	28.5±6.8	
Cholesterol	6.5±0.8mmol/L	4.3±0.9mmol/L	0.477

Table 2: Mean ± SD, minimum and maximum levels of obtained values among pregnant women at third period of gestation (n=120).

	Mean ±SD	Minimum	Maximum
At 24 th -28 th week of pregnancy (n=18)			
Age (years)	22.3±2.5	20	26
Cholesterol (mmol/L)	6.1±0.7	5.3	7.2
At 28 th -32 nd week of pregnancy (n=34)			
Age (years)	27.7±4.7	18	37
Cholesterol (mmol/L)	6.4±0.8	5.2	7.7
At 32 nd - 36 th week of pregnancy (n=68)			
Age (years)	26.3±6.4	17	40
Cholesterol (mmol/L)	6.7±0.8	5.2	8.8

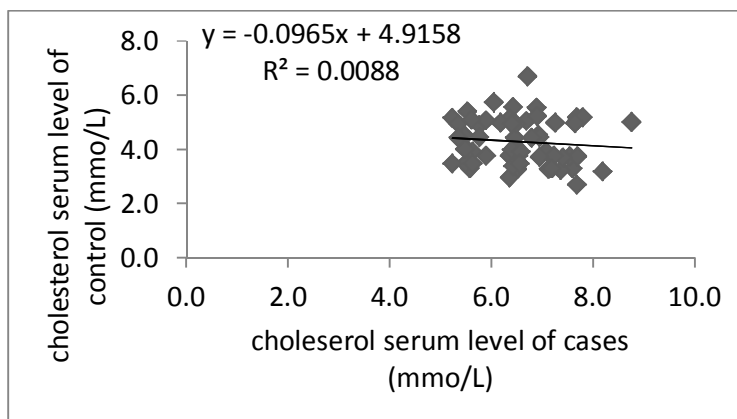


Figure 1: Correlation plot of cholesterol serum levels in cases and controls, (P=0.477).

DISCUSSION

Findings of this study showed that cholesterol serum levels were elevated at the third trimester of pregnancy, mean was 6.5±0.8mmol/L. Levels were increased as pregnancy developed during 24th - 28th, 28th - 32th and 32nd - 36th weeks of gestation.

About 40% of pregnant ladies were having cholesterol level (≤6.5mmol/L). However, greater than 50% of pregnant ladies had cholesterol level (>6.5mmol/L). The present results agreed with results of Lippi, *et al.* 2007 and Smita, *et al.* 2013 which showed increased cholesterol levels in pregnant

women. However, Lippi, *et al* in 2007 observed that lipid parameters tested were significantly modified by the gestational age; in particular, women in the second and third trimester displayed significantly increased total cholesterol. Plasma cholesterol was higher in pregnant subjects than in the non-pregnant, the increase being more appreciable in early pregnancy.^[6] Total cholesterol was elevated during the second and third trimesters of pregnancy but dropped sharply after pregnancy.^[6] Cholesterol levels were elevated in all trimesters of pregnancy, with median values from first trimester raised outside the non-pregnant adult range.^[15] The plasma cholesterol concentration increased in the second trimester.^[7] Husain, *et al*, 2010 found that pregnant women had significantly higher concentrations of serum LDL-cholesterol. Higher concentrations of serum LDL-cholesterol was more common in pregnant than control and reaching maximum at 3rd trimester of pregnancy.^[16] This elevation of LDL-cholesterol may be a purely physiological response to pregnancy or it may be indicative of pathology in some women.^[17] Previous study found that pregnant women who had elevated cholesterol levels of 7.2mmol/L were more likely to develop pregnancy-induced hypertension (PIH), the potentially dangerous condition that can threaten the life of both mother and infant.^[17] The only treatment for PIH is delivery of the baby.^[17]

CONCLUSIONS

This study indicated that the serum concentration of cholesterol increased as pregnancy gestational age increased. Evaluation of lipid and lipoprotein concentrations during antenatal period can be helpful in the early detection and prevention of pregnancy induced hypertension. The implications of elevated cholesterol level on fetus and mother deserve further investigation.

The best advice for pregnant women is to follow the guidance of their health care providers when it comes to diet and exercise.

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