GLOBAL JOURNAL OF PURE AND APPLIED SCIENCES, VOL.8, NO. 3 JUNE 2002:315 - 317
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SERUM LIPID PROFILES OF A POPULATION OF PREGNANT WOMEN IN BORNO STATE NIGERIA

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(Received 3 August 2001; Revision accepted 22 February 2002)

ABSTRACT

The serum lipid profiles of 269 pregnant women in North-eastern Nigeria were studied. Thirty-four apparently healthy non-pregnant women were used as control subjects. The results of the study show a significant increase in total cholesterol, triacylglycerol, low density lipoprotein and phospholipid levels of pregnant women relative to those of the control. While serum phospholipid showed a linear increase from the first trimester of pregnancy to the third, serum total cholesterol and low density lipoprotein each peaked at the second trimester. The mean serum high density lipoprotein level of pregnant women at second trimester, 0.92 ± 0.06mmol/l was significantly lower than that of control subjects which was 1.43 ± 0.10mmol/l. Changes in lipid metabolism during pregnancy are physiological and may be related to increased metabolic rate and the need to prepare the would-be mother for lactation.

Key words: Serum lipids, pregnancy, North-eastern Nigeria

INTRODUCTION

Maternal lipids make a considerable contribution to fetal lipids. Apart from the fact that fat is required as fuel for muscular work in pregnant women, lipids have an important role in virtually all aspects of life serving as hormones or hormone precursors, aiding in digestion (absorption of fat soluble vitamins and some other substances), acting as functional and structural components in biomembranes and forming insulation to allow nerve conduction or to prevent heat loss (Mayes, 1990). Of the numerous different lipids known to exist in humans, only a limited number are of clinical and analytical importance.

Although some works have been reported on changes in serum lipid levels of pregnant women in western and eastern Nigeria, (Taylor, 1972; Alumanah and Onyeneke, 1990), there is a paucity of data on this in northern Nigeria especially in north-eastern Nigeria. This informed the undertaking of this work. The work reported here recognised the customary division of pregnancy into three time intervals (trimesters), each of which is slightly longer than thirteen (13) weeks.

MATERIALS AND METHODS

Subjects: The samples used in this work were collected from two hundred and sixty nine apparently healthy pregnant women attending antenatal clinics at the University of Maiduguri Teaching Hospital (UMTH), and the State Specialist Hospital, Maiduguri. Informed consent of the patients and the approval of the administrations of these hospitals were obtained to carry out this work. The subjects were grouped according to gestation period, based on their antenatal records. Note was also made of their age, weight, social status and parity.

Control: Thirty four apparently healthy subjects, mostly female students of the University of Maiduguri who were not on any form of medication were recruited after obtaining their informed consent as control subjects. These subjects were certified not to be pregnant.

Sample collection: Five millilitres (5ml) of venous blood samples were collected from each subject between 07.00 and 10.00 hours into sterile plain (non-anticoagulant) plastic specimen bottles, well labelled with the subject's name, age, gestational age and date of sample collection. The samples were allowed to clot before the sera were separated by centrifugation at 3000rpm and put into correspondingly labelled containers. The samples were analysed the same day for total cholesterol, triacylglycerols, high and low density lipoproteins and phospholipids.

Analysis of serum lipids: Serum lipids were analysed using kits supplied by Randox Laboratories Limited, Diamond Road, Crunlin, Co. Antrim, United Kingdom (through ABJ Consolidated Limited, Maiduguri, their

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representative in North-Eastern Nigeria). All assays were enzymatic.

Statistical Analysis: The results were analysed by one way analysis of variance.

RESULTS

The biodata and serum lipid levels of the control and pregnant women in the various trimesters (1st, 2nd and 3rd) used in this work are shown in Table 1.

Except for serum high density lipoprotein levels, the serum levels of all other lipids studied (cholesterol, triacylglycerol, low density lipoprotein and phospholipids) appear to have increased during pregnancy. The serum cholesterol level in the second trimester was significantly increased ($P < 0.05$) relative to the control group and the value at first trimester. The triacylglycerol levels of pregnant women were significantly different ($P < 0.05$) in all the trimesters compared to the control subjects. This is also true of serum phospholipid levels. The low density lipoprotein level of the pregnant women increased significantly ($P < 0.05$) in the first and second trimesters.

DISCUSSION

Pregnancy is the period from the last normal menstrual period (LNMP) to parturition, normally 40 weeks or 280 days (Roper, 1988). It is a physiological process that alters the physiological state of the body, with the changes ranging from increased hormonal secretion to elevated basal metabolic rate and increased muscular activities (Warth *et al*, 1975; Robert *et al*, 1980). The results of this work on serum lipid profiles in Borno State Nigeria generally agree with data in the literature on lipid levels in pregnancy. Pregnancy is characterised by a considerable rise in most plasma lipids (Hachey, 1994) to the extent that the picture is frequently referred to as a hyperlipidaemia.

In this work, the total cholesterol level in the various trimesters of pregnancy was significantly higher than that of control subjects. The increase peaked at the second trimester. This agrees with the work of Alumanah and Onyeneke (1990) who reported an increase in early pregnancy. A linear increase in serum cholesterol level takes place from early pregnancy until about the last few weeks when it appears to stop. Darmandy and Postle (1982), had reported an initial decrease in cholesterol during the first trimester which later rose to a

Table 1: Biodata and serum lipid levels of control and pregnant women in various trimesters.

Gestation period	Age (yrs)	Body weight (kg)	Parity	Total cholesterol mmol/l	Triacyl-glycerol mmol/l	Low density lipoprotein mmol/l	High density lipoprotein mmol/l	Phospho-lipids mmol/l
Control (n=34)	$25.25^{a,b}$ ± 1.47	58.42 ± 1.17	1.08^{a} ± 0.38	4.33^{a} ± 0.19	0.99^{a} ± 0.07	2.47^{a} ± 0.18	1.43^{a} ± 0.10	1.90^{a} ± 0.18
First trimester (n=61)	21.74^{a} ± 0.59	57.12^{a} ± 1.54	2.73^{b} ± 0.26	4.85^{a} ± 0.13	1.44^{b} ± 0.08	3.07^{b} ± 0.09	$1.13^{a,b}$ ± 0.07	2.17^{b} ± 0.28
Second trimester (n=111)	25.32^{b} ± 0.99	63.85^{b} ± 1.56	$3.43^{b,c}$ ± 0.38	$5.92^{b,c}$ ± 0.14	1.28^{b} ± 0.07	3.14^{b} ± 0.11	0.92^{b} ± 0.06	2.21^{b} ± 0.35
Third trimester (n=97)	25.96^{b} ± 0.92	62.95^{b} ± 1.78	4.29^{c} ± 0.32	$5.15^{a,c}$ ± 0.16	1.39^{b} ± 0.09	$2.86^{a,b}$ ± 0.11	1.20^{a} ± 0.07	2.27^{b} ± 0.33

Values are means ± S. E. M.

Means with the same superscript letter in a column are not statistically significant ($P > 0.05$)

peak at the third trimester. It has been shown that serum cholesterol binding reserve, the serum's capacity to solubilize additional cholesterol rises even more in pregnancy than does cholesterol (Roth *et al*, 1978). Most of the increases have however been reported to be in the very low density lipoprotein (VLDL) cholesterol. The increase in low density lipoprotein in this work peaked in the second trimester.

The results of this work also show increases in triacylglycerol and phospholipid of pregnant women relative to those of control subjects. Alumanah and Onyeneke (1990), suggested that the parallel rise in cholesterol and phospholipid may have some physiological significance, possibly aiding in lipid transport and milk formation. Pregnant women display an initial rise in triacylglycerol during the first trimester (Darmandy and Postle, 1982).

Elevated lipid content during pregnancy may be related to increased metabolic rate and the need to prepare the would-be mother for lactation. These processes are influenced by hormones. Specific energy requirements are greatest during the second trimester of pregnancy, when relatively large amounts of maternal fat are laid down to form an energy bank. During the final trimester, such fat storage practically stops and most of the energy required for the formation of new tissues is that due to the growth of the foetus, which is accompanied by considerable rise in oxygen consumption (Darmandy and Postle, 1982). Energy costs of maintenance could be completely subsidized during late pregnancy by stored fat.

The decrease in high density lipoprotein (HDL) observed in this work with age of pregnancy is consistent with the work of Tayeau *et al*, 1982. Changes in lipid metabolism during pregnancy are entirely physiological and return to normal levels after parturition (Tietz, 1976; Alumanah and Onyeneke, 1990; Atiku *et al*, 1995).

This work posits that serum lipid profiles of pregnant women in Borno State are generally consistent with data in the literature. It therefore complements the body of data on serum lipid levels of pregnant women in Nigeria and especially provides a benchmark for detecting their abnormal level in pregnant women in Borno State, Nigeria.

REFERENCES

Alumanah, E.O. and Onyeneke, F.C., 1990. Effect of pregnancy on plasma lipid levels of Nigerian women. J. Clin Biochem. Nutr., 8: 69 – 74.

Atiku, M.K., Gwarzo, M.Y. and Sen, K.K., 1995. Serum total cholesterol and high density lipoprotein cholesterol profile in pregnant and lactating women of Dawakin-Kudu, Kano State, Nigeria. Nig. J. Biochem. Mol. Biol. 10: 17 – 20.

Darmandy, J.M. and Postle, A.D., 1982. Lipid metabolism in pregnancy. Br. J. Obstet. Gynecol., 89: 211 – 215.

Hachey, D.L., 1994. Benefits and risks of modifying maternal fat intake in pregnancy and lactation. Am. J. Clin. Nutr., 59: 463 – 464.

Mayes, P.A., 1990. Lipids of physiological significance. In: Harpers Biochemistry. 22nd ed. R.K. Murray, P.A. Mayes, D.K. Granner and V.W. Rodwell. Eds. Appleton and Lange, Norwalk. Pp 134 – 145.

Robert, K., Kysenko, N., Manning, J.A., Monroe, S.E. and David, A.B., 1980. Sex steroid modulation of fatty acid utilization and fatty acid binding protein concentration in rat liver. J. Chin. Invest. 65: 103 – 107.

Roper, N., 1988. Churchill Livingstone Pocket medical dictionary. 14th ed. Longman Singapore Publishers, Singapore.

Roth, M.S., Donato, D.M., Lensman, H.H., Robertson, E.G., Hsia, S.L. and Lematre, W.I., 1978. Effect of steroids on serum lipids and serum cholesterol binding reserve. Am. J. Obstet. Gynecol. 132: 151.

Tayeau, F., Maviel, M.J., Durmon, M.F., Azoulai, B., Rebeyrotte, P., Dubecq, J.F., Horowitz, J. and Lafanne-le, Souchu, T., 1982. Experimental research on the origin of pregnancy hyperlipoproteinaemia. I. Historical study and examination of 320 sera of pregnant women: Bordeaux Med. 15(20): 965 – 970.

Taylor, G.O., 1972. Serum lipids and fatty acid composition in pregnant Nigerian women. J. Obst. Gynae. of British Commonwealth 79: 68 – 71.

Tietz, N.W., 1976. Fundamental of clinical chemistry. 2nd ed. W.B. Saunders Co., Philadelphia. Pp. 527 – 529.

Warth, M.K., Arky, R.A. and Knoop, R.H., 1975. Lipid metabolism in pregnancy. Altered lipid composition in intermediate, very low and high density lipoprotein fractions. J. Clin. Endocrinol. Med. 41(4): 649 – 655.