



**Short Communication**

# Dyslipidemia in pregnancy in a rural population in North India

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Physiologically, a female becomes almost a new person during pregnancy because of profound local and systemic changes initiated by conception which continue throughout pregnancy. Biochemical changes during pregnancy have been studied extensively, but mostly in urban populations. In this study we report changes in serum lipids and lipoproteins in rural pregnant women. The study was conducted on sixty pregnant women (20 each in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> trimester) from rural population. Biochemical investigations for accessing serum lipids were done on a fully automatic analyser (TrivitronNanolab 150) using standard kits. Serum triglycerides, serum total cholesterol, low density lipoprotein and very low density lipoprotein were found to be increased significantly ( $p < 0.001$ ) in sixty pregnant women as compared to twenty non-pregnant women from rural areas near Jaipur. Serum triglycerides were raised 2.7 fold in the third trimester of pregnancy as compared to non-pregnant women. Serum high density cholesterol was comparable in the two groups. This preliminary study underlines the need for investigating serum lipid changes in pregnancy in bigger rural samples in different parts of the country.

**Keywords:** Dyslipidemia, triglycerides, high density lipoproteins, low density lipoproteins, cholesterol, rural pregnant women, cardiovascular diseases

## INTRODUCTION

Changes in carbohydrate and lipid metabolism occur during pregnancy to ensure a continuous supply of nutrients to the growing fetus despite intermittent maternal food intake (Butte, 2000). During the early pregnancy, maternal metabolic environment is modified by rise in serum level of estrogen and progesterone, pancreatic beta cell hyperplasia and an increase in the secretion of insulin (Kalkhoff, 1964). Hyperinsulinemia leads to increased peripheral glucose utilization, a decline in fasting plasma glucose level, increased tissue storage of glycogen, increased storage of fats and decreased lipolysis (Kaaja and Tikkanen, 1995). Many scientific evidences have raised concern about the adverse effects of abnormal blood lipid levels, like

cholesterol and other lipids and lipoproteins, on atherosclerotic disease thereby highlighting the importance attached to the need for routine examination of the serum lipid and lipoprotein profile in human subjects, especially during pregnancy (Glew et al., 2004). Pregnancy is accompanied by significant variation in maternal lipid metabolism (Stock and Metcalfe, 1994).

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**Table 1.** Body weight and blood pressure in controls and pregnant women

| Parameters       | Control<br>(n=20) | 1 <sup>st</sup> trimester<br>(n=20) | 2 <sup>nd</sup> trimester<br>(n=20) | 3 <sup>rd</sup> trimester<br>(n=20) |
|------------------|-------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Weight (kg.)     | 55.80+3.00        | 57.60+2.90                          | 63.15+2.97                          | 68.35+2.68                          |
| BPsyst/dia(mmHg) | 122/80            | 118/75                              | 120/75                              | 115/74                              |

Normal range of BP: 1Results in mean  $\pm$ SD

In early pregnancy, there is increased body fat accumulation associated with both hyperphagia and increased lipogenesis while in late pregnancy there is an accelerated breakdown of fat depots, which have an important role in fetal development (Herrea, 2001). Pregnancy and lactation constitute states of considerable physiological stress which imposes increased nutritional demands. If these demands are not adequately met, it may be expected that not only the nutritional status of the subject will be affected, but also the course of pregnancy and lactation (Gopalan, 1962).

A number of studies have revealed that serum lipid and lipoprotein profile varies with age, sex, diet and race (Salisu and Atiku, 2009). Generally at household level, cultural norms, practices and socio-economic factors determine the extent of nutritional status among women (Mallikharjuna et al., 2010). Studies have suggested that the intake of income elastic food such as milk, oils and fats are higher in rural pregnant and lactating women (Jood and Bishnoi, 2002). The high fertility of Indian women also has a detrimental socio-cultural influence on nutritional status because the metabolic stresses of pregnancy and lactation may not be adequately compensated by dietary intake before, during or even after these physiological processes (Chatterjee, 1989).

Lipid profile is estimated to detect primary and secondary lipid disorders (hyper- or hypo- lipemias) usually involving serum Cholesterol, HDL, TG, LDL and VLDL. Hyperlipidemia refers to the increase in the plasma concentrations of triglycerides or cholesterol which predispose to the formation of atherosclerotic plaque. A number of experimental studies on mice have shown that the presence of saturated fats in maternal diet during pregnancy can have deleterious effects on the plasma lipids of off springs (Chechi and Cheema, 2006). But, no studies are available that address the influence of high fat diet given to pregnant women in rural areas because of cultural practices and socio-economic factors on the serum lipid levels during pregnancy which is the reason for undertaking the present investigation.

## MATERIAL AND METHODS

The study was conducted on sixty pregnant women (20

each in 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> trimester) from rural population attending the antenatal clinics of Department of Obstetrics and Gynaecology, NIMS Medical College and Hospital, Jaipur, Rajasthan. Twenty age-matched non-pregnant women from the same population served as controls. Hypertension, diabetes mellitus and other systemic diseases were ruled out by clinical examination. Age, dietary habits and clinical and personal details of the study subjects were documented with the help of a structured questionnaire after prior consent. Permission of the Institute Ethical Committee was taken beforehand.

Five ml of venous blood sample was collected from each subject after an overnight fast. Biochemical investigations were done on a fully automatic analyser (TrivitronNanolab 150) using standard kits. Fasting and post prandial blood sugar was estimated by the GOD-POD method (Kalpana, 1984). Serum Total cholesterol (TC) was determined by CHOD-PAP method (Stock and Metcalfe, 1994), serum HDL-Cholesterol was estimated after precipitating out VLDL and LDL by PEG-CHOD-PAP method (Stock and Metcalfe, 1994), serum triglyceride levels were estimated by GPO-PAP method (Herbert, 1984), LDL-Cholesterol and VLDL-Cholesterol were calculated by Friedewald's equation (Friedewald et al., 1972 );

LDL-Cholesterol (mg/dl) = Total Cholesterol- HDL cholesterol- TG/5

VLDL-Cholesterol (mg/dl) = Triglycerides/5

The data obtained from different groups were compared and statistically analysed by Student's t-test. The level of significance was set as  $p < 0.05$ .

## RESULTS

Table 1 shows the body weight and blood pressure of non-pregnant and pregnant women. The weight increased with progression of pregnancy. Blood pressure was comparable and normal. Table 2 shows the mean  $\pm$ SD values of blood sugar and serum lipids in different groups.

The fasting and post prandial blood sugar in controls and in the different trimesters of pregnancy were within normal range and do not show any significant difference. Serum total cholesterol, LDL and VLDL levels were significantly ( $P < 0.001$ ) higher in all trimesters of pregnancy when compared with non-

**Table 2.** Biochemical analytes in Control and Pregnant women

| Parameters                    | Control<br>n=20 | 1 <sup>st</sup> trimester<br>n=20 | 2 <sup>nd</sup> trimester<br>n=20 | 3 <sup>rd</sup> trimester<br>n=20 |
|-------------------------------|-----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Blood sugar (fasting) (mg/dl) | 88.04±9.38      | 89.55±8.20 <sup>NS</sup>          | 88.00±6.97 <sup>NS</sup>          | 92.55±8.84 <sup>NS</sup>          |
| Blood sugar (PP) (mg/dl)      | 108.12±6.51     | 112.35±8.66 <sup>NS</sup>         | 116.55±8.86 <sup>NS</sup>         | 116.25±10.10 <sup>NS</sup>        |
| TC (mg/dl)                    | 164.36±21.52    | 194.9±24.41*                      | 243.8±24.62*                      | 250.05±20.38*                     |
| TG (mg/dl)                    | 77±7.21         | 118.75±36.46*                     | 152.9±26.34*                      | 208±45.02*                        |
| HDL (mg/dl)                   | 45.12±7.19      | 44.5±6.98 <sup>NS</sup>           | 41.35±5.35 <sup>NS</sup>          | 46.65±5.10 <sup>NS</sup>          |
| LDL(mg/dl)                    | 89.84±25.17     | 126.65±25.59*                     | 157.25±18.47*                     | 161.8±22.61*                      |
| VLDL(mg/dl)                   | 15.4±1.44       | 23.75±7.29*                       | 30.58±5.26*                       | 41.6±9.00*                        |

Blood sugar fasting normal range: 70-110 mg/dl

Results in mean ±SD, \* p < 0.001 significant change, <sup>NS</sup> = Non- significant change

pregnant group. The rise was progressive as the pregnancy advanced. Serum triglyceride levels were also significantly higher (p<0.001) in all the three trimesters of pregnancy in comparison to non-pregnant group. The rise was more than 1.5 times in the 1<sup>st</sup> trimester, more than 2 times in the 2<sup>nd</sup> trimester and around 3 times in the 3<sup>rd</sup> trimester as compared to the control group. Serum HDL levels did not show a significant difference between different groups.

## DISCUSSION

Maternity and child health services have expanded significantly in India after independence. Antenatal check-ups and institutional deliveries are now available in many rural areas. However, ignorance about health issues is still rampant. One belief, handed down from generation to generation, is that a women has to be fed a large amount of fat during pregnancy (Mallikharjuna et al., 2010). We have tried to investigate the effect of such fat dense diet on serum lipids.

Our results show that none of the pregnant or non-pregnant subjects were diabetic or hypertensive. The weight gain during pregnancy was on the expected lines. The startling difference between pregnant and non-pregnant women was in serum lipids though both the groups hailed from similar rural areas and had similar lifestyle. All the serum lipids except the protective HDL, were significantly higher in pregnant women as compared to non-pregnant women. The rise started in the first trimester and persisted or accentuated throughout the pregnancy.

Hormonal changes during pregnancy e.g. hyperestrogenemia are well documented and contribute to hyperlipidemia (Glueck et al., 2011). But the role of

dietary lipids cannot be ignored as it is preventable. Repeated pregnancies are not uncommon in rural areas. If serum lipids become abnormal repeatedly for prolonged periods, they can affect cardio-vascular health (Kita et al., 2001). This preliminary study underlines the need for investigations on larger samples in different parts of the country.

## REFERENCES

- Butte NF (2000). Carbohydrate and lipid metabolisms in pregnancy compared with gestational diabetes mellitus. *Am. J. Clin. Nutr.* 71(5): 1256s-1261s.
- Chatterjee M (1989). Socio-economic and socio-cultural influences on women's nutritional status. In: C Gopalan, Suminder Kaur (Eds.): *Women and Nutrition in India*. New Delhi, Spl. Pub. Seri. No.5: pp. 297-323.
- Chechi K, Cheema SK (2006). Maternal diet rich in saturated fats has deleterious effects on plasma lipids of mice. *Exp. Clin. Cardio.* 111(2):129-135.
- Friedewald W, Levy R, Fredrickson D (1972). Estimation of concentration of low Density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin. Chem.* 18: 499-515.
- Glew RH, Bhanji RA, Kassam HA, Okorodudu A, Vander DJ (2004). Review article: Pregnancy & CVD Risk factors. *Highland Med. Res. J.*, 2(2) :1-8.
- Glueck CJ, Fallet RW, Scheel D (2011). Comparative study of lipid profile in normal pregnancy. *Archives of Applied Science Research.* 3(3) :528-532.
- Gopalan C (1962). Effect of nutrition on pregnancy & lactation. *Bull. World Health Organ.* 26(2):131-133.
- Herbert K (1984). Lipid In: *Clinical Chemistry. Theory, Analysis and Co-relation*. Kaplan LA & Pesce AJ Eds. C.V. Mosby, Toronto pp.1182-1203.

Herrea E (2001). Metabolic adaptation in pregnancy and their implication for the availability of substrate to the fetus. *Eur. J. Clin. Nutr.*, 54:547-549.

Jood S, Bishnoi S (2002). Nutritional status of rural pregnant women of Haryana state, Northern India. *Nutrition and Health*. 16(2):121-131.

K.Mallikharjuna R, Balakrishna N, Arlappa N, Laxmaiah A, Brahmam GNV (2010). Diet and nutritional status of women in India. *J. Hum. Ecol.*, 29(3):165-170.

Kaaja R, Tikkanen MJ (1995). Serum lipoprotein, insulin and urinary prostanoid metabolites in normal hypertensive pregnant women. *Obstet. Gyneco.* 85(3):253-256.

Kalkhoff RK (1964). Metabolic effect of the conception on maternal metabolism during pregnancy. *Excerpta Medica*. 12:679-681.

Kalpana LA (1984). Carbohydrates and metabolite In: *Clinical Chemistry: Theory, Analysis and Co-relation*, Kalpana LA, Pesce A.J. Eds. C.V. Mosby, Toronto pp.1032-1040.

Kita T, Kume N, Minami M (2001). Role of oxidized LDL in atherosclerosis. *Ann. N. Y. Acad. Sci.* 947:199-206.

Salisu AI, Atiku MK (2009). Serum lipid profile in non-pregnancy and pregnant Hausa-Fulani women at second and third trimesters of pregnancy in Kura local

government area, Kona State, Nigeria. *Bajopas*. 2(2):131-133.

Stock MJ, Metcalfe J (1994). Maternal physiology during gestation In: Knobil E and Neil JD (eds), *The physiology of reproduction*. Raven press, New York. Pp. 947-983.

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