Effect Of Sex Hormonal Changes On Serum Lipid Profile In Diabetic And Non-Diabetic Indian Females

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Abstracts: Background**:** Sex hormones and impaired glucose metabolism resulting from Insulin abnormalities are the major important determinants in the development of coronary heart disease (CHD) in females. The present work was envisaged to study the effect of sex hormonal changes on serum lipids in females of different age groups and physiological status i.e. menstruation and menopause. Methodology: The comparisons were made between diabetic females of both the phases (menstruation and menopause) and age matched non-diabetic females. Further comparisons were made between diabetic females of menopause phase and diabetic females of menstruation phase. Results: In the study when comparisons were made between menstruating diabetics and menstruating non-diabetics, the former group showed significant increase in plasma glucose, serum total cholesterol (TC), Triglyceride (TG), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels. Similarly comparisons were made between menopausal diabetics and menopausal non-diabetics, the former group showed significantly higher levels of plasma glucose, serum TC, TG, LDL and VLDL. However it is noticed that HDL levels did not very significantly in both the comparisons. Also in diabetic menopausal females there is a significant increase in serum TG levels as compared to diabetic menstruating females. Conclusions: In present study, in non-diabetic menopausal females there is a significant increase in plasma glucose, serum TC, TG, LDL and VLDL concentration levels as compared to non-diabetic menstruating females. Also in diabetic menstruating and menopausal females, there is a significant increase in plasma glucose, TC, TG and VLDL levels as compared to non-diabetic menstruating and menopausal females. [Patel H NJIRM 2015; 6(6):35-38]

Key Words: Sex hormones, lipid profile, diabetic females, menopause.

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Introduction: Vital statistics of the United States[1] and Thom T J[2] reported that cardio-vascular diseases are currently the leading cause of death in both sexes and actually accounted for greater proportion of all death in women (52%) than in men (46%) in the United States. Reviewing the literature, revealed that very little is known about the risk factors like TC, TG, LDL, high density lipoprotein (HDL) and VLDL for CHD in Indian females in general. Some of the strongest determinants of lipids in women are sex hormones (estrogen & progesterone).

Brown et al[3] reported that the opportunity to use estrogen for its lipid modifying action that has substantial potential to facilitate intervention in women. Disturbances of glucose and insulin metabolism are also major important factors in the development of CHD was reported by Abbott et al.[4] It is known that diabetic women have higher incidence of CHD than diabetic men, which suggests that sex hormones influences glucose and insulin metabolism.

Material and Methods: The present work was conducted at Biochemistry department of PSMC, Karamsad with permission of ethical committee, on 450 females who were placed into three different age groups i.e. 18-35 years, 36-50 years and above 50 years. Prior to the beginning of the study, the objectives of this study were explained to all the subjects and individual histories were obtained. Consent of all the subjects was registered. Further the subjects were divided into 225 healthy non-diabetic subjects (75 in each age group), 225 diabetic subjects (75 in each age group); and they were investigated for blood glucose, lipid profile and sex hormones.

Over-night fasting blood samples were collected from all the subjects with disposable syringes and needles between 7.00 am to 9.00 am to avoid diurnal variation. The plasma / serum was separated by centrifugation at 4000 rpm and used for biochemical estimation of plasma glucose: Trinder,[5] serum TC: Allain et al,[6] serum TG: Mc. Gowan et al,[7] Serum HDL cholesterol: Lopes-Virella et al,[8] Serum estradiol: Ratcliffe et al[9] and Serum progesterone: Wood P et al[10] on a semi-auto-analyser (SEACH CH 100). Serum LDL and VLDL cholesterol was calculated using Friedewald W T et al[11] formula

VLDL in mg % = TG/5

LDL in mg % = TC - (VLDL + HDL).

Glucose reagent kits were purchased from Ortho Diagnostic Bombay. TC, TG, HDL cholesterol reagent kits were purchased from Miles India Ltd, Baroda. Estradiol and Progesterone EIA kits were purchased from Biomerieux, marketed by Cadila Hospital Products Ltd, Ahmedabad. Results of collected data were statistically analyzed. The standard deviation and standard error were calculated. The significant values were expressed in terms of 'P' value by applying student's unpaired 't' test.

Results and Discussion: In the present study in non-diabetic menopausal females (i.e. above 50 years) there is a significant ($P < 0.01$; $P < 0.05$) increase in plasma glucose, serum TC, TG, LDL and VLDL concentration levels as compared to non-diabetic menstruating females of both age groups (i.e. 18 - 35 years and 36 - 50 years). Which are in line with several studies evaluating the association of menopause with changes in lipid and lipoprotein concentrations by comparing menstruating and menopausal females. Bush T et al[13] reported that the menopausal women had significantly higher concentrations of TC and LDL than the menstruating women. Bengtsson et al[14] also found that becoming menopausal state was associated with a modest but significant increase in TC and body weight.

Table 1: Shows plasma glucose, serum lipid profile and sex hormones in relation to age in non-diabetic and diabetic females.

Parameters **Total Non-diabetic: 225** **Total Diabetic: 225**	**18-35 Years** **75 Nos.** **75 Nos.**	**36-50 Years** **75 Nos.** **75 Nos.**	**Above 50 Years** **75 Nos.** **75 Nos.**
Plasma glucose (mg%)			
Non-diabetic	80.1 ± 1.2	80.9 ± 1.1	93.0 ± 2.3
Diabetic	151.9 ± 6.5	141.2 ± 9.9	145.8 ± 9.9
Serum TC (mg%)			
Non-diabetic	151.9 ± 3.4	174.6 ± 5.1	189.7 ± 5.4
Diabetic	201.7 ± 4.1	196.3 ± 6.7	216.6 ± 7.1
Serum TG (mg%)			
Non-diabetic	68.7 ± 4.1	91.7 ± 6.3	120.4 ± 7.4
Diabetic	166.1 ± 4.5	167.5 ± 5.4	180.1 ± 5.0
Serum HDL cholesterol (mg%)			
Non-diabetic	49.2 ± 1.5	48.7 ± 2.6	45.9 ± 1.4
Diabetic	43.8 ± 1.4	41.4 ± 2.2	48.7 ± 3.4
Serum VLDL cholesterol (mg%)			
Non-diabetic	15.3 ± 1.8	18.4 ±1.2	24.O ± 1.4
Diabetic	33.1 ± 0.8	33.3 ± 3.0	36.1 ± 4.4
Serum LDL cholesterol (mg%)			
Non-diabetic	99.3 ± 4.1	105.9 ± 4.4	122.7 ± 4.3
Diabetic	124.0 ± 3.3	125.6 ± 6.6	131.6 ± 9.9
Serum TC / HDL ratio			
Non-diabetic	3.1 ± 0.1	3.8 ± 0.2	4.4 ± 0.1
Diabetic	4.5 ± O.1	4.7 ± O.2	4.6 ± 0.4
Serum LDL / HDL ratio			
Non-diabetic	1.8 ± 0.1	2.3 ± 0.2	2.8 ± 0.1
Diabetic	2.8 ± 0.1	3.2 ± 0.2	2.8 ± 0.3
Serum estradiol (ng/L)			
Non-diabetic	115.7 ± 17.8	111.9 ± 14.3	29.5 ± 4.0
Diabetic	93.1 ± 08.6	99.0 ± 13.3	27.O ± 2.8
Serum Progestron (ng/ml)			
Non-diabetic	2.7 ± O.5	2.5 ± 0.7	0.2 ± 0.0
Diabetic	1.6 ± 0.4	1.4 ± O.2	0.1 ± 0.0

Also in our study diabetic menstruating females of both the age groups (i.e. 18 - 35 years and 36 - 50 years) and diabetic menopausal females (i.e. above 50 years) there is a significant ($p < 0.01$; $P < 0.05$) increase in plasma glucose, serum TC, TG and VLDL levels as compared to non-diabetic females of respective age groups. Also in diabetic menopausal females there is a significant ($P < 0.05$) increase in serum TG concentration levels as compared to diabetic menstruating females.

The importance of estrogens in the development of metabolic diseases during menopause is disputed.[15] It has been observed that menopause (especially loss of ovarian function and endogenous estrogen) puts women at an increased risk of CHD. Brown BG et al[3] and Some MR et al[12] showed that the hormone replacement therapy, which has been associated with protection against CHD in women, can reduce lipoprotein [Lp (a)] levels substantially.

The present study also supports the well established fact that in diabetes mellitus the loss and ineffective utilization of glucose leads to break down of fats and proteins. The need for fatty acid break down to meet energy requirement would lead to production of more acetyl Co A. The acetyl Co A cannot be efficiently oxidized by TCA cycle. The excess of acetyl Co A is diverted to ketone bodies formation and also to cholesterol and TG formation. The lack of insulin further aggravates the condition by increased lipid mobilization. As a result there is a hyperlipidemia especially increase in TC, TG and non-esterified fatty acids in plasma.

Conclusion: Sex hormones strongly influence body fat distribution and adipocyte differentiation. The absence of estrogens is a clue factor in the onset of cardiovascular disease during the menopausal period, which is characterized by lipid profile variations and predominant abdominal fat accumulation. Lower levels of the hormones estrogen and progesterone, and human growth hormone contribute to lower metabolism and obesity which is the major cause of type II diabetes during menopause in females.

The contribution of estrogen deficiency in the pathobiology of multiple chronic diseases in women is emerging as a conceivable therapeutic challenge of the 21st century. Studies have shown that early management of the disease along with lifestyle change can increase quality of life and limit the level of debilitation of the disease.

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