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ESTABLISHING THE CORRELATION OF ESTRADIOL AND LIPID PROFILE TO BMI IN POST-MENOPAUSAL FEMALES HAVING TYPE-II DIABETES MELLITUS

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ABSTRACT

Background: The transition of females to the postmenopausal state is vulnerable to developing obesity deciding the future development of cardiovascular disease and type II diabetes mellitus in these subjects. Insulin deficiency and resistance affect the lipid metabolism in diabetics.

Aim: To assess the correlation of Estradiol and lipid profile to the body mass index in the postmenopausal females having type II diabetes mellitus by evaluating Estradiol and lipid profile based on the BMI.

Methods: In 240 postmenopausal females having type 2 diabetes mellitus, venous blood was analyzed for Estradiol, fasting glucose, LDL-C, HDL-C, triglycerides, and total cholesterol. For each subject, weight and height were recorded. BMI was divided into 3 categories as obese (<30), overweight (25-25kg/m2), and normal (<18.5-24.9 kg/m2) categories.

Results: Spearman's correlation was used for assessing the correlation of lipid parameters to Estradiol, it was seen that the significant results were seen with BMI with p=0.02. Estradiol levels were highest in the obese subjects followed by overweight and normal weighted subjects with respective mean values of 1.3, 1.18, and 0.3nmol/l respectively (p=0.04). HDL was higher in normal-weight subjects (42.6±6.37) and reduced significantly to 37.3±4.7 and 31±2.7mg/dl in overweight and obese subjects with p=0.03. Triglyceride levels were significantly higher in overweight subjects followed by obese and normal-weight subjects (p=0.04)

Conclusion: The study concludes that postmenopausal obese females having type II diabetes mellitus have high Estradiol concentration and high atherogenic risk profile in them.

Key Words: BMI, Estradiol, Lipid profile, Obesity, Post-menopausal, Type 2 diabetes

INTRODUCTION

Diabetes mellitus is associated with a high risk of morbidity and mortality globally and constitute the leading healthcare concern in the human race. In subjects with diabetes mellitus, one of the major causes of death is contributed by the cardiovascular diseases secondary to compromised lipid metabolism by insulin deficiency and insulin resistance leading to dyslipidemia causing mortality.[1]

Dyslipidemia in the diabetics is usually depicted by raised levels of low-density lipoproteins and triglycerides and decreased levels of high-density lipoproteins. There are reported incidences of increased obesity rates with increased type II diabetes level prevalence. As per WHO (World Health Organization), obesity is marked by BMI levels of >30kg/m2. In comparison to the non-obese subjects, obese subjects with BMI >30kg/m2 are at higher risk of developing type II diabetes mellitus as depicted by the previous literature studies.[2]

In addition, in postmenopausal females, insulin sensitivity is also altered by decreased concentration of estrogen, high intake of the diet, and a lack of exercise and physical activity. Previous literature data also suggest a strong association with raised triglycerides (TG), total cholesterol (TC), and BMI, and an inverse correlation with HDL-C without taking estradiol levels into consideration.[3]

The studies assessing the postmenopausal females having diabetes mellitus are scarce in the literature.[4] Hence, the present study aimed to assess the correlation of Estradiol and lipid profile to the body mass index in the postmenopausal females having type II diabetes mellitus by evaluating Estradiol and lipid profile based on the BMI.

MATERIALS AND METHODS

The present clinical study was conducted to assess the correlation of Estradiol and lipid profile to the body mass index in the postmenopausal females having type II diabetes mellitus by evaluating Estradiol and lipid profile based on the BMI. The study population was comprised of diabetic postmenopausal females visiting the Outpatient Department of the Institute.

The study included 240 postmenopausal females in the age range of 44-66 years and a mean age of 52.6±4.24 years. The inclusion criteria for the study were postmenopausal females, females with type II diabetes mellitus, and females who were willing to participate in the study. The exclusion criteria for the study were females having renal diseases, chronic infections, and pregnant females. After explaining the detailed study design, informed consent was taken from all the study participants.

After the final inclusion of the study subjects, under strict aseptic and sterile conditions, intravenous blood was collected after an overnight fast in a vial containing anticoagulant to analyze lipid profile and blood glucose levels. A semi-automated enzymatic analyzer was used for the assessment of the lipid parameters.

To record the demographics and disease-related characteristics of the study subjects, a semi-structured questionnaire was used which assessed diabetic status, menopause period,

menopause status, and age of the subjects. Weight and height were also noted in all the subjects and BMI (kg/m2) was calculated from height and weight. BMI was divided into 3 categories as obese (<30), overweight (25-25kg/m2), and normal (<18.5-24.9 kg/m2) categories.

Hypertriglyceridemia was defined by TG >150mg/dl and HDL-C of >40mg/dl, hypercholesterolemia by LDL-C >130mg/dl and TC>200mg/dl. Normal values were defined by HDL-C, LDL-C, triglycerides, and total cholesterol levels of ≥40mg/dl, <130mg/dl, <150mg/dl, and <200mg/dl respectively following the national cholesterol education programme.

The collected data were subjected to statistical evaluation using SPSS version 20, Chicago Inc., USA. The data were expressed in percentage and number, and mean and standard deviation. The level of significance was kept at $p<0.05$.

RESULTS

The present study assessed 240 postmenopausal females in the age range of 44-66 years and a mean age of 52.6±4.24 years. BMI was divided into 3 categories as obese (<30), overweight (25-25kg/m2), and normal (<18.5-24.9 kg/m2) categories. The normal weight category had 86 females, the overweight had 80 females, and the obese group had 74 subjects.

On comparing the Estradiol, lipid parameter, and glucose levels in the three study groups, the Estradiol levels were highest in the obese subjects followed by overweight and normal weighted subjects with respective mean values of 1.3, 1.18, and 0.3nmol/l respectively This difference was statistically significant with p=0.04. VLDL and LDL levels showed no statistically significant difference between the three study groups with respective p-values of 0.125 and 0.07. HDL was higher in normal-weight subjects (42.6±6.37) and reduced significantly to 37.3±4.7 and 31±2.7mg/dl in overweight and obese subjects with p=0.03. Triglyceride levels were significantly higher in overweight subjects followed by obese and normal-weight subjects (p=0.04). FBS levels were significantly higher in obese subjects (p=0.02). BMI was also higher in obese subjects. However, the difference was statistically non-significant (p=0.145) as shown in Table 1.

Pearson correlation analysis was used to assess lipid parameters and BMI in the study subjects. The results showed that Tc with BMI showed the r and p as -0.067 and 0.53 respectively for TG it was 0.026 and 0.05 (significant) respectively, and for HDL-C r and p-values were 0.142 and 0.03 respectively which was statistically significant and for LDL-C r and p-values were 0.133 and 0.23 respectively. For total cholesterol, r and p values for TG, HDL-C, and LDL-C were statistically significant, having values of 0.242 and 0.05, 0.327 and 0.05, and 0.872 and 0.000 respectively. On correlating TG to HDL-C and LDL-C, no statistically significant results were seen. On assessing the correlation of HDL-C to LDL-C in the study subjects, a statistically significant result was seen with r and p-values of -0.562 and 0.03 respectively (Table 2).

Spearman's correlation was used for assessing the correlation of lipid parameters to Estradiol, it was seen that the significant results were seen with BMI with p=0.02. However, for TC, TG, HDL-C, and LDL-C, the results showed a non-significant correlation with p-values of 0.77, 0.16, 0.15, and 0.56 respectively (Table 3).

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DISCUSSION

The study results showed that on comparing the Estradiol, lipid parameter, and glucose levels in the three study groups, the Estradiol levels were highest in the obese subjects followed by overweight and normal weighted subjects with respective mean values of 1.3, 1.18, and 0.3nmol/l respectively This difference was statistically significant with p=0.04. VLDL and LDL levels showed a statistical difference between the three study groups with respective p-values of 0.125 and 0.07. HDL was higher in normal-weight subjects (42.6±6.37) and reduced significantly to 37.3±4.7 and 31±2.7mg/dl in overweight and obese subjects with p=0.03. Triglyceride levels were significantly higher in overweight subjects followed by obese and normal-weight subjects (p=0.04). FBS levels were significantly higher in obese subjects (p=0.02). BMI was also higher in obese subjects. However, the difference was statistically significant (p=0.145). These results were consistent with the results of Mahabir S et al[5] in 2006 and Barton M[6] in 2010 where authors reported similar results of glucose levels, lipid parameters, and Estradiol in postmenopausal females.

With Pearson correlation analysis for lipid parameters and BMI in the study subjects. The results showed that TC with BMI showed the r and p as -0.067 and 0.53 respectively for TG it was 0.026 and 0.05 (significant) respectively, and for HDL-C r and p-values were 0.142 and 0.03 respectively which was statistically significant and for LDL-C r and p-values were 0.133 and 0.23 respectively. For total cholesterol, r and p values for TG, HDL-C, and LDL-C were statistically significant, having values of 0.242 and 0.05, 0.327 and 0.05, and 0.872 and 0.000 respectively. On correlating TG to HDL-C and LDL-C, no statistically significant results were seen. On assessing the correlation of HDL-C to LDL-C in the study subjects, a statistically significant result was seen with r and p-values of -0.562 and 0.03 respectively. These findings were in agreement with the studies of Awa WL et al[7] in 2012 and Hinge CR et al[8] in 2018 where authors reported a similar correlation between BMI and lipid parameters as shown by the results of the present study.

Spearman's correlation was used for assessing the correlation of lipid parameters to Estradiol, it was seen that the significant results were seen with BMI with p=0.02. However, for TC, TG, HDL-C, and LDL-C, the results showed a non-significant correlation with p-values of 0.77, 0.16, 0.15, and 0.56 respectively. These results were similar to the studies of Bingo B et al[9] in 2017 and Omotoye FE[10] in 2016 where authors reported a significant correlation between Estradiol and BMI and no significant correlation of Estradiol to other lipid parameters.

CONCLUSION

The present study concludes that in postmenopausal females having diabetes mellitus, there is a high risk of atherogenic diseases owing to low HDL-C levels, high estrogen, high TG, and abnormal BMI in these subjects. The effect of BMI on lipid profile in diabetic subjects is vital for the development of cardiovascular diseases and atherosclerosis. This outcome might be attributed to a sedentary lifestyle and poor glycemic control. The present study had a few limitations including a smaller sample size and a short monitoring period. Universal acceptance is not associated with Blumenthal incision owing to its large incision. Also, ease of performing and learning frown incision is low, however, SIA has made its choice among ophthalmic surgeons.

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TABLES

Parameter	Normal weight (n=86)	Over weight (n=80)	Obese (n=74)	p-value
Estradiol (nmol/l)	0.3 (0.1-0.5)	1.18 (0.3-1.66)	1.3 (1.0-2.2)	0.04
VLDL (mg/dl)	26.7±5.7	27.5±8.3	29.3±11.2	0.125
LDL (mg/dl)	103±45.3	109±42.4	120±44.7	0.07
HDL (mg/dl)	42.6±6.37	37.3±4.7	31±2.7	0.03
TG (mg/dl)	133±21.3	140±27.3	139±31.4	0.04
TC (mg/dl)	169±46.2	177±51.2	178±45.2	0.54
FBS (mg/dl)	148±30.2	152±32.5	160±36.3	0.002
BMI (kg/m2)	22.4±2.42	27.2±1.1	34.2±2.6	0.145

Table 1: Comparison of Estradiol, lipid parameter, and glucose levels in three groups of the study subjects

Parameter	BMI	TC	TG	HDL-C
TC	r: -0.067	-	-	-
	p: 0.53	-	-	-
TG	r: 0.026	r: 0.242	-	-
	p: 0.05	p: 0.05	-	-

HDL-C	r: 0.142	r: 0.327	r: 0.063	-
	p: 0.03	p: 0.05	p: 0.54	-
LDL-C	r: 0.133	r: 0.872	r: 0.096	r: -0.562
	p: 0.23	p: 0.000	p: 352	p: 0.03

Table 2: Lipid parameters and BMI analysis using Pearson correlation analysis

Parameter	**BMI**	**TC**	**TG**	**HDL-C**	**LDL-C**
Estradiol (nmol/l)	0.233 (0.02)	-0.07 (0.77)	0.137 (0.16)	0.282 (0.15)	0.056 (0.56)

Table 2: Estradiol correlation with lipid parameters and BMI using Spearman's correlation