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Original Article

Dyslipidemia in Postmenopausal Women: A Case Control Study

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Abstract

Background: Menopause is a natural process. After menopause the morbidity and mortality from cardiovascular disease are increased. Lack of oestrogen protection, aging effect, increased body weight, android pattern of body fat distribution seems to be the major cause. In post menopausal women, there is an increased tendency for body fat deposition in the abdominal region that leads to low HDL and increased LDL. The aim of thy study is to document the serum lipid abnormality in obese postmenopausal women and to compare the lipid status between obese and non-obese postmenopausal women. **Methods**: This comparative study was conducted at the Department of Medicine, SMCH from Oct 2010 to Sept 2011 for duration of 1 year. After taking history, physical examination weight and height were taken, body mass index (BMI), waist hip ratio (WHR) were calculated and 4 ml of venous blood were taken from all subjects after 12-hour overnight fasting. **Results**: It was observed significantly positive correlation between TC, LDL level and W/H ratio and significantly negative correlation between HDL level and W/H ratio and significantly positive correlation between TG, TC, LDL, and BMI and significantly negative correlation between HDL and BMI. It was also observed significantly positive correlation between TG and WC, TC and WC, LDL and WC and significantly negative correlation between HDL and WC. **Conclusion**: It can be concluded from this study that mixed type of hyperlipidemia is present in postmenopausal women. Dyslipidemia is more pronounced in central obese post-menopausal women. Dyslipidemia is significantly correlated with WHR, waist circumference, and BMI.

Key words: Dyslipidemia; Postmenopausal women; Body mass index; Waist hip ratio.

INTRODUCTION

After menopause, the morbidity and mortality from cardiovascular disease are increased[1]. Lack of oestrogen protection, aging effect, increased body weight, android pattern of body fat distribution seems to be the major issue.[2] The metabolic phenotype of post menopausal women, which includes an increased tendency for body fat deposition in the abdominal region suggested that insulin resistance on lipid metabolism with subsequent effects on circulating triglycerides may be the primary metabolic defects that leads to low HDL and increased LDL which are the key features of the atherogenic lipo-protein phenotype.[3, 4] The Framingham study revealed that obesity was an independent risk factor for the cardiovascular disease in men and women including coronary artery disease,

stroke and congestive heart failure. Cardiovascular disease remains the major cause of death in post menopausal women.[5] So it is important to study lipid abnormalities in postmenopausal women with obesity. The aim of this study is to explore the pattern of serum lipid abnormality in postmenopausal women, and to compare the lipid status between obese and non-obese postmenopausal women, and to correlate the degree of severity of obesity with the dyslipidemia.

MATERIALS AND METHODS

It was a case control study done in the Department of Medicine (indoor and outdoor) in SMCH from October 2010 to September 2011. Subjects were physiological postmenopausal women (natural menopause transition—amenorrhea for at least 12 months). Sample size was 100 (control 50 non-obese, case 50 obese post menopausal women). It was taken by purposive sampling.

Inclusion Criteria

Case

1. Obese postmenopausal women
2. Age more than 45 years

Control

1. Non-obese postmenopausal women
2. Age more than 45 years

Exclusion Criteria

1. Age more than 80 years
2. Those who will not give consent
3. Acute medical condition: acute MI, acute stroke
4. Those taking drug which impaired lipid metabolism: HRT, steroid, thiazides, beta blockers
5. Surgical postmenopausal women

Detail Plan of the Study

After selection of the subjects, the objectives, nature, and purpose for the study will be explained to the subjects in detail and informed written consent from the subject will be taken. After taking history, physical examination BMI, WHR will be calculated and 4 ml of venous blood will be taken from all subjects. A value that correlates better with body fat is the body mass index (BMI), waist circumference, and WHR. Individual with BMI between 25 and 29.9 are overweight and BMI ≥ 30 defined as obese. WHR more than 0.85 is considered as central obese in women.

Operational Definition

Weight: Weight was measured with a spring balance that was kept on a firm horizontal surface. Subjects wore light clothing, stood upright without shoes and weight was recorded to the nearest 0.5 kg. The scale was calibrated every day with standard weight.

Height: Height was measured with a tape to the nearest centimeter. Subjects were requested to stand upright without shoes with their back against the wall, heels together, and eyes directed forward.

WHR (waist hip ratio): Waist circumference was measured in centimeters at the level of midway between lower rib margin and iliac crest. Hip circumference was measured in centimeter at the level of greater trochanter. WHR was measured by measuring the waist circumference in centimeters divided by the hip circumference in centimeters. These measurements were taken by a single nurse.

Blood sampling technique: After 12 hours over night fasting by all the study subjects 4 ml of fasting venous blood sample will be collected form the median cubital vein by disposable plastic syringe with all aseptic precaution. The needle gets detached from the nozzle and blood will transfer immediately into dry, clean test tube with a gentle push to avoid haemolysis. The test tube will be kept in standing position till the formation of clot. Centrifuging the blood at 3000 rpm for 5 ms, serum will be separated and all the biochemical tests will be carried without delay.

Data Collection and Analysis

The history and findings of physical examination including investigational findings were recorded after informed consent of the patient. All data was collected in individual case record form and each form contains different ID number. The necessary investigation result was collected and recorded in an attached sheet. Collected data was arranged and analyzed using computer with statistical package SPSS (Version 12.0). A comparative analysis was done for comparing lipid status between obese and non-obese postmenopausal women. Results were expressed as mean ±SD. *T*-test was done for statistical significance. Pearson correlation coefficient (*r*) was used to see the level of significance between mean BMI and mean W/H ratio with the serum lipid profiles.

RESULTS

Fifty (50) cases of postmenopausal obese women and 50 non-obese age matched control postmenopausal women

were included in this study. Out of 50 cases, 34 were central obese and 16 were generalized obese. Among the central obese the mean age was 63.06 years and that of the generalized obese 60.50 years and among 50 non-obese healthy controls, the mean age was 62.60 years. The mean BMI in central obese was 36.11 ± 1.95, in the generalized obese 37.21 ± 1.62, and in control group 22.15 ± 1.15. The mean waist circumference in central obese was 102.29 ± 4.91, range 96–116 and in the generalized obese 77.25 ± 2.72, and in control group 76.84 ± 3.53. The mean hip circumference in central obese was 99.12 ± 4.85, in the generalized obese 101.13 ± 2.28 , and in control group 97.60 ± 4.43. The mean W/H ratio in central obese were 1.03 ± 0.02, in the generalized obese 0.76 ± 0.02 and in control group 0.78 ± 0.01. The mean total cholesterol in central obese was 205.94 ± 13.07, in the generalized obese 200.75 ± 4.70, and in control group 179.96 ± 10.34. The mean HDL in central obese was 32.18 ± 1.88, in the generalized obese 35.38 ± 1.02 and in control group 41.64 ± 1.45. The mean LDL in central obese was 113.65 ± 12.50, in the generalized obese 111.37 ± 4.56 and in control group 107.12 ± 9.63. The mean TG in central obese was 299.53 ± 28.42, in the generalized obese 269.88 ± 15.84 in control group 155.40 ± 4.75. The Pearson correlation coefficient (r) and level of significance between BMI in kg/m^2 and serum lipid profiles shows significantly positive correlation between TG and BMI (r 0.28, $p < 0.05$) in cases (Table 1). The Pearson correlation coefficient (r) and level of significance between W/H ratio and serum lipid profiles shows significantly positive correlation between TG and W/H ratio (r –0.465, $p < 0.01$) and significantly negative correlation between HDL and W/H ratio (r –0.661, $p < 0.001$) in cases (Table 2).

DISCUSSION

Obesity is a well documented separate risk factor for metabolic and vascular disease, which may reduce life expectancy

Table 1: Pearson correlation coefficient (r) and level of significance between BMI in kg/m^2 and serum lipid profiles

Parameters		Correlation with	Correlation coefficient	*P* value	Sig.
Serum total cholesterol in mg/dl	Total (n = 100)	BMI in kg/m^2	0.743	0.000	HS $P < 0.001$
	Case (n = 50)		–0.006	0.966	NS $P > 0.05$
	Control (n = 50)		0.211	0.141	NS $P > 0.05$
Serum HDL in mg/dl	Total (n = 100)	BMI in kg/m^2	–0.885	0.000	HS $P < 0.001$
	Case (n = 50)		–0.040	0.785	NS $P > 0.05$
	Control (n = 50)		0.461	0.001	HS $P < 0.01$
Serum LDL in mg/dl	Total (n = 100)	BMI in kg/m^2	0.264	0.008	HS $P < 0.01$
	Case (n = 50)		–0.145	0.315	NS $P > 0.05$
	Control (n = 50)		0.167	0.247	NS $P > 0.05$
Serum TG in mg/dl	Total (n = 100)	BMI in kg/m^2	0.950	0.000	HS $P < 0.001$
	Case (n = 50)		0.282	0.047	S $P < 0.05$
	Control (n = 50)		0.017	0.907	NS $P > 0.05$

HS = highly significant.; S = significant; NS = not significant

Table 2: Pearson correlation coefficient (r) and level of significance between W/H ratio and serum lipid profiles

Parameters		Correlation with	Correlation coefficient	*P* value	Sig.
Serum total cholesterol in mg/dl	Total (*n* = 100)	WHR	0.574	0.000	HS *P* < 0.001
	Case (*n* = 50)		0.186	0.196	NS *P* > 0.05
	Control (*n* = 50)		0.285	0.045	S *P* < 0.05
Serum HDL in mg/dl	Total (*n* = 100)	WHR	–0.774	0.000	HS *P* < 0.001
	Case (*n* = 50)		–0.661	0.000	HS *P* < 0.001
	Control (*n* = 50)		–0.058	0.688	NS *P* > 0.05
Serum LDL in mg/dl	Total (*n* = 100)	WHR	0.240	0.016	S *P* < 0.05
	Case (*n* = 50)		0.078	0.592	NS *P* > 0.05
	Control (*n* = 50)		0.331	0.019	S *P* < 0.05
Serum TG in mg/dl	Total (*n* = 100)	WHR	0.733	0.000	HS *P* < 0.001
	Case (*n* = 50)		0.465	0.001	HS *P* < 0.01
	Control (*n* = 50)		–0.109	0.453	NS *P* > 0.05

HS = highly significant; S = significant; NS = not significant

for overweight people.[1,2] Obesity has very high costs not only for the well being and survival of individuals, but also for societies. The resulting disabilities and diseases create huge burdens for health systems and families.[4,5] Menopause tends to be associated with an increased risk of obesity and a shift to an abdominal fat distribution with associated increase in health risk.[6,7] Weight gain, increased central adiposity, adverse changes in body fat distribution and body composition may be due to hormonal changes occurring during the menopause transition.[8] In this study we have measured serum lipid profile in 50 cases of postmenopausal obese women and 50 non-obese control postmenopausal women. Among 50 obese postmenopausal women 34 were central obese and 16 were generalized obese. Poehlman et al. prospectively compared women who became postmenopausal was associated with an increase in the WHR and abdominal fat.[1] Carr states the transition from pre- to post-menopause is associated with increased abdominal fat, a shift towards a more atherogenic lipid profile, increase glucose and insulin level.[2] Our finding is similar with that the above statement. In this study, mean age of control were 62.60 years, range 55–69 years, mean BMI 22.15 kg/m², range 19.55–24.06 kg/m², mean waist circumference 76.84, range 70–85. Mean age of central obese were 63.06 years, range 54–72 years, mean BMI 36.11 kg/m², range 31.96–39.47 kg/m², mean waist circumference 102.29, range 96–116. Mean age of generalized were 60.50 years, range 55–65 kg/m², mean BMI 37.21kg/m², range 34.23–39.36 kg/m², mean waist circumference 77.25, range 73–80. Lovegrove et al. recruited volunteers with a mean age 62 years, range 52–76 years, mean BMI 27.2 kg/m², range 20.5–38.8 kg/m², mean waist circumference 86.4, range 63.5–124.0 kg/m². This is almost similar.[8] The mean serum HDL level were found to be significantly low and mean TG, mean serum TC and mean serum LDL level were found to be significantly high in post menopausal women. Many longitudinal studies have shown that

TG, LDL level increase, and HDL level decreases with transition through the menopause and the increase in TG also appears early in the postmenopausal period. Poehman et al. found that prospective transition to post menopause was associated with a 16% increase in TG, 11% increase in LDL, and 9% decline in serum LDL level. Our study is similar with this observation. The mean serum HDL-C level is found to be significantly low and mean serum TG, mean serum LDL, and serum TC level is found to be significantly high in central obese cases compared to that of control. This finding supports other similar studies done by Carr[2] and Rasquali et al.[9] In our study serum TC level, serum LDL and TG level was found to be significantly high and HDL level was found to be significantly low in generalized obese in comparison to control. In our study lipid profiles of central obese are compared with those of generalized obese. Serum HDL-C level was found to be significantly low and serum TC and serum TG was found to be significantly high in central obese in comparison with generalized obese. These findings were almost similar with the observation of Carr.[2] Serum LDL level did not increase significantly. It may be due to small sample size. In this study WHR is used as indicators of central obesity and BMI is used as indicators of generalized obesity. In our study it was found that there was significant negative correlation between WHR and serum HDL level and positive correlation between WHR and TG level and there was no significant relationship between TC and serum LDL level in cases. Seidell et al. observed that larger waist and smaller hip circumferences related in opposite direction to risk factors such as low HDL-cholesterol, high TG and high insulin concentration. Our study is similar with this observation. Poehlman et al.[1] also noted significant relationship between the increases in WHR with decreases in HDL level. Rasquali et al.[9] found that both TC and LDL level were significantly correlated with BMI, regardless of the effects of menopause on body weight and body composition.[9] Chang et al. observed significant positive correlation between BMI with TC and LDL level.[5] In our study it was found that there was significant positive correlation between serum TG levels with the BMI and there was no significant relationship between TC, LDL, and HDL level in cases which may be due to small sample size. Oestrogens may play an independent role in the regulation of lipid metabolism in women. Moreover they may favor the decrease of LDL cholesterol level and up-regulate LDL receptor density. This effect may partially disappear during the menopause because of the decrease in oestradiol production rate, blood concentrations, and tissue delivery[9–13]. In this study of central obese cases we have found significantly increased TG and TC level and decreased HDL level. Central obesity is associated with a threatening combination of metabolic abnormalities that includes dyslipidemia (low HDL and high TG), insulin resistance, glucose intolerance, and hypertension which have been referred to metabolic syndrome.[14,15] Individual with this syndrome have a significantly increased risk for developing diabetes mellitus and cardiovascular disorder. So increased TG and low HDL-C is a risk factor for central obese postmenopausal women.

Because of time and financial constrains we had to conduct the case control study with small sample size. So we recommend that further prospective studies with large sample size should be carried out to evaluate the degree of dyslipidemia in central obesity and generalized obesity of postmenopausal women. Extensive studies should be done on central obesity—in both men and women and children in Bangladesh. All postmenopausal women with central obesity as well as all the people in the society should be aware about the complications of obesity. Early precaution to diagnose and treatment of metabolic syndrome can prevent catastrophe.

CONCLUSION

It can be concluded from this study that mixed type of hyperlipidemia is present in postmenopausal women (low HDL, elevated TG, and raised LDL). Dyslipidemia is more pronounced in central obese postmenopausal women (low HDL and elevated TG) and is significantly correlated with WHR and BMI. Central obesity is more harmful than general obesity due to the combination of dyslipidemia (low HDL and elevated TG concentration).

Competing Interest: There was no conflict of interest.

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