A Study to Evaluate Body Composition and Lipid Profile in Postmenopausal Women

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Abstract

Introduction: Menopause is physiological event in women's life and is associated with unfavourable changes in body composition and abdominal fat distribution as well more atherogenic lipid profile. Therefore, the present study was undertaken to study the body composition and lipid profile in postmenopausal women. *Materials and Methods:* Sixty-nine postmenopausal women were selected after their consent and divided into two groups. Group-I consists of 32 postmenopausal women within 5 years of menopause and Group-II consists of 37 postmenopausal women after 5 years of menopause. The body composition parameters were measured by classical anthropometry and skin fold callipers and lipid profile parameters were analysed by enzymatic method. Institutional ethical clearance was obtained. *Statistical Analysis*: Data was expressed as mean±SD. Student's unpaired' test was used for analysis. p value less than 0.01 was considered statistically significant. *Results*: The mean values of body Weight, BMI, BSA, WC, HC, FM, FFM, FMI and MM were more in Group-I compared to Group-II and WHR and BF% were more in Group-II compared to Group-I. These variations were not statistically significant. The lipid profile parameters i.e. TC, TG, HDL-C, LDL-C, VLDL-C, TC/HDL in Group-II subjects were found to be nonsignificantly higher when compared to Group-I subjects. *Discussion and Conclusion*: The increase in the lipid profile in Group-II subjectsmay be due to increased intra-abdominal adipose tissue. These changes may be due to hormonal changes and depend on physical activity, life style, diet, smoking, alcohol consumption, ethnicity and genetic make-up of individual rather than on duration after menopause.

Keywords: Menopause; Body Composition; Lipid Profile.

Introduction

Menopause is a natural event in the ageing process and signifies the end of reproductive years with cessation of cyclic ovarian functions as manifested by cyclic menstruation. It is heralded by menopausal transition, a period when the endocrine, biological and clinical features of approaching menopause begins [1]. The hormonal changes associated with menopause i.e. low plasma levels of oestrogen and marked increase in LH and FSH levels exerts a significant effect on plasma lipids and lipoproteins [2].

It was reported that, the body mass index (BMI) matched obese postmenopausal women have significantly higher waist circumference (WC), waist hip ratio (WHR) and intra-abdominal fat volume compared with premenopausal women. Total Cholesterol (TC) and Triglyceride (TG) were significantly higher and HDL-C was significantly lower in postmenopausal women. When age matched pre- and postmenopausal women were compared only TC was significantly higher in postmenopausal group [3]. However, older postmenopausal women (>50years) had significantly higher WC and WHR compared with younger postmenopausal women (<50years).

There was no difference in total body fat-free or appendicular skeletal muscle mass in healthy premenopausal women and early postmenopausal women. In contrast, total body fat mass was 28% higher and percentage fat 17% higher in postmenopausal women compared with premenopausal women. Postmenopausal women had a 49% greater intra-abdominal and a 22% greater abdominal subcutaneous fat area compared to premenopausal women. The menopause related difference in intra-abdominal fat persisted after statistical adjustment for age and total body fat mass,

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whereas no difference in abdominal subcutaneous fat was noted. A similar pattern of differences in total and abdominal adiposity was noted in sub samples of pre- and postmenopausal women matched for age or fat mass [4].

In healthy women, during the time from premenopausal to first year Postmenopausal examinations, the changes in LDL-C, TG, and BMI were larger than those between first and fifth year Postmenopausal examinations [5]. There have been studies regarding the effect of menopause on body weight, fat distribution, total fat%, and also on lipid profile, but most of the studies are conducted on western population. As Indian population differs in body composition and lifestyle, this study was undertaken to evaluate the effect of duration of menopause on body composition parameters and lipid profile parameters in postmenopausal women.

Materials and Methods

The present study was conducted in the department of physiology, Shimoga institute of Medical Sciences, Sagar Road, Shivamogga. Sixty-nine postmenopausal were selected after their consent. The institutional ethical clearance was obtained. The participants were divided into two groups as, Group-I consists of 32 postmenopausal women within 5 years of menopause and Group-II consists of 37 postmenopausal women after 5 years of menopause. All healthy postmenopausal women, who attained menopause by natural means were included. Postmenopausal women who have undergone hysterectomy, diabetic, hypertensive, on hormone replacement therapy, lipid lowering drugs & with H/O Gynaecological & hormonal disorders were excluded.

Measurement of Physiological Parameters

Height was measured on a wooden stadiometer, bearing a flat stand and a vertical surface with marking in centimetres. A sliding head piece was used for accurate work. Height was recorded and expressed in centimetres. Body weight (Wt) of all the subjects was measured by using weighing scale and expressed in kilogram. Body surface area (BSA) in Sq. Mts (m^2) was calculated by Duboi's nomogram. The body mass index was derived by Quetelet's index from body weight (kg)/height (m^2). Waist circumference was measured at narrowest part of torso with plastic tape. Hip circumference was measured at maximal extension of buttocks with

plastic tape. Waist-Hip Ratio was calculated by dividing waist circumference by hip circumference.

Body fat percentage was calculated by using skin fold callipers. A skin fold callipers is a device which measures the thickness of a fold of skin with its underlying layer of fat. By measuring at key locations it is possible to estimate the total percent of body fat of a person. The callipers used is scientifically developed and calibrated. The instrument has springs which exerts certain pressure on skin fold ($10g/mm^2$) and measures the thickness in millimetres.

The fold of skin with its underlying layer of fat was pulled out and grasped in the fingers of left hand, while holding the callipers in the right hand, the jaws of callipers were held about one fourth inch from the fingers of the left hand, which continues to hold the fold of the skin. The trigger of the callipers was released so that the entire force of the jaws was on the skin folds.

The skin fold thickness was measured on the left side at four sites such as Back of the mid-arm (Triceps), Front of the mid–arm (Biceps), Below the shoulder blade on the back (sub scapular) and Waist area above hip bone (suprailiac). The measurement was taken in all four areas & added together, and then body fat percentage was determined from the chart in the instruction manual.

The fat mass was calculated as FM=Wt/100XBF% and expressed in kilograms. Fat free mass was calculated and expressed in kilograms as FFM=Weight-fat mass. Fat mass index was calculated from fat mass in (kg)/Height in (m^2). Muscle Mass was calculated by knowing fat free mass as MM=50% of FFM.

Measurement of Lipid Profile Parameters

After overnight fasting 2ml of venous blood was collected from each subject and centrifuged at 3000rpm for 15min to obtain the serum which was used for analysis.

The level of Triglyceride, Total-cholesterol, HDL-cholesterol, LDL- cholesterol, VLDL- cholesterol were measured using semi-automated analyser (Erba star 21 plus) using commercially available kits.

Statistical Analysis

Data was expressed as mean±SD. The student's unpaired 't' test was used to analyse the variations in body composition and lipid profile between two groups of postmenopausal women. P value less than 0.05 was the level of significance.

Results

The mean ± SD of age of subject was found to be 48±3. 5yrs in Group-I and 58±7.8yrs in Group-II, the mean duration after menopause was 2. 81±1. 43yrs in Group-I and 13. 73±6. 34yrs in Group-II.

The weight of the subject was 50.91±11.35kg in Group-I and 49±8.2kg in Group-II. The BMI of the subject was 23.3±4.86kg/m² in Group-I and 22.42± 3.60 kg/m² in Group-II. The BSA of the subject was found to be 1.4±0.10m² in Group-I and 1.4±0.1m² in Group-II. WC of the subject was found to be 75.31± 12.20cms in Group-I and 75±9.1cms in Group-II. The difference in all these parameters were statistically insignificant (p>0.05) when compared between two groups (Table 1).

The HC of the subject was 95.6±11.30cms in Group-I and 94± 8.6cms in Group-II. The WHR of the subject was 0.79±0.07 in Group-I and 0.80±0.1 in Group-II. The BF% of the subject was 29.5±5.82% in Group-I and 30.1±3.77% in Group-II. The FM of the subject was15.6±6.46 kg in Group-I and15± 3.91kg in Group-II. The difference in all these parameters were also statistically insignificant (p>0.05) when compared between two groups (Table 1).

The FFM of the subject was 35.4±5.28 kg in Group-I and 34.2± 4.91kg in Group-II. The FMI of the subject was 7.12±2.86 kg/m² in Group-I and 6.85±1.81kg/

m² in Group-II. The MM of the subject was 17.7± 2.66kg in Group-I and 17.1±2.46kg in Group-II. MM was more in Group-I compared to Group-II. But these parameters differ nonsignificantly (p>0.05) when compared between two groups (Table 1).

Lipid Profile Parameters

The TC of the subject was 194±28.44 mg/dl in Group-I and 205.3±38.59 mg/dl in Group-II (Table 2). The TG of the subject was 189±55.07mg/dl in Group-I and 194±51.1mg/dl in Group-II. The HDL-C of the subject was 44.7±6.78mg/dl in Group-I and 46.13±6.05mg/dl in Group-II. HDL-C was more in Group-II compared to Group-I (Table 2). The LDL-C of the subject was 112±26.76mg/dl in Group-I and 120.17± 35.86mg/dl in Group-II. LDL-C was more in Group-II compared to Group-I. The VLDL-C of the subject was 37.6±10.81mg/dl in Group-I and 38.88± 10.23mg/dl in Group-II. VLDL-C was more in Group-II compared to Group-I (Table 2). The TC/HDL of the subject was 4.49± 0.93 in Group-I and 4.56±1.10 in Group-II. TC/HDL was more in Group-II compared to Group-I. The HDL/LDL of the subject was 0.42± 0.12 in Group-I and 0. 42±0.14 in Group-II which is was same in both groups. There was no statistical difference (t=0.0404, p>0.05). These parameters also did not show any significant difference (p>0.05) when compared between two groups (Table 2).

Table 1: Comparison of bodycomposition parameters of subjects between Group-I and Group-II. Values are mean±S.D. N=69

Parameters	Group-I	Group-II	t-value	p-value
Weight (kg)	50.91±11.35	49±8.2	0.8086	>0.05, NS
Height (cms)	148±6.84	148±9.01	0.0124	>0.05, NS
Body Mass Index (kg/m²)	23.3±4.86	22.42±3.60	0.8618	>0.05, NS
Body Surface Area (m²)	1.4±0.10	1.4±0.1	0.000	>0.05, NS
Waist Confence (cm)	75.31±12.20	75±9.1	0.1206	>0.05, NS
Hip Conference (cm)	95.6±11.30	94±8.6	0.6667	>0.05, NS
Waist Hip Ratio	0.79±0.07	0.8±0.1	0.4739	>0.05, NS
Body Fat (%)	29.5±5.82	30.1±3.77	0.5148	>0.05, NS
Fat Mass (kg)	15.6±6.46	15±3.91	0.4738	>0.05, NS
Free Fat Mass (kg)	35.4±5.28	34.2±4.91	0.9776	>0.05, NS
Fat Mass Index (kg/m²)	7.12±2.86	6.85±1.81	0.4926	>0.05, NS
Muscle Mass (kg)	17.7±2.66	17.1±2.46	0.9730	>0.05, NS

Table 2: Comparison of lipid profile parameters of subjects between Group-I and Group-II. Values are mean± S.D. N=69

Parameters	Group-I	Group-II	t-value	p-value
Total Cholesterol (mg/dl)	194±28.44	205.3±38.59	1.3659	>0.05, NS
Triglyceride (mg/dl)	189±55.07	194±51.1	0.3910	>0.05, NS
HDL (mg/dl)	44.7±6.78	46.13±6.05	0.9258	>0.05, NS
LDL (mg/dl)	112±26.76	120.17±35.86	1.0585	>0.05, NS
VLDL (mg/dl)	37.6±10.81	38.88±10.23	0.5049	>0.05, NS
TC/HDL	4.49±0.93	4.56±1.10	0.0404	>0.05, NS
LDL(mg/dl)	0.42±0.12	0.42±0.14	0.0000	>0.05, NS

Discussion

In the present study, the mean values of body weight, BMI, BSA, WC, HC, FM, FFM, FMI and MM were more in Group-I compared to Group-II and WHR and BF% were more in Group-II compared to Group-I but not statistically significant. All the body composition parameters were within physiological limits in both the groups except BF% and FM which were found to be above the normal range. Insignificant difference in body composition parameters between Group-I and Group-II is similar to the study by Quinglong wang et al [6].

Increase in BF% and FM above physiological limit in both groups is similar to the study as reported by Douchi T et al [7]. Other body composition parameters were within physiological limit is supported by Edith T, KevinPD, and Douglas RS [8]. Body fat and fat distribution are more dependent on age than on menopause, changes in fat free mass, including a postmenopausal decline in both soft lean tissue mass and bone mass are mainly menopause related [6]. So, in our study increase in BF%, FM above normal range in both the groups may be age related rather than duration of menopause and menopause itself. The previous studies have proved that lean body mass does not change in premenopausal women and decreases after the menopause and correlates with years since the onset of menopause. However, studies proving these data used modern sophisticated methods such as dual-energy X-ray absorptiometry or computed tomography for lean mass, bone and muscle mass assessment and not the classical anthropometry [9]. Body composition parameters also depend on physical activity, life style, dietary habits [10], ethnic group and genetic makeup of individual. This may be the reason for most of body composition parameters to be within physiological limits in our study.

In Group-I subjects TC, HDL-C, VLDL-C, TC/HDL were normal, LDL-C was above normal and TG was borderline high whereas in Group-II subjects HDL-C, VLDL-C were normal LDL-C was above normal and TC, TG were borderline high and TC/HDL was also high. However, it was found that lipid profile parameters in Group-II subjects were found to be statistically non-significant higher when compared to Group-I subjects. In our study no relation between lipid profile parameters and time since menopause i.e. duration after menopause could be established. This may indicate that the determining factors of lipid profile in postmenopausal women are physical activity, life style [11], diet, smoking, alcohol consumption [12], ethnicity and genetic make-up of individual rather than duration after menopause. The changes in lipid profile occur at menopausal transition itself under the influence of hormonal change.

Conclusion

The increase in the lipid profile in Group-II subjects may be due to increased intra-abdominal adipose tissue. These changes may be due to hormonal changes and depend on physical activity, life style, diet, smoking, alcohol consumption, ethnicity and genetic make-up of individual rather than on duration after menopause.

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