

**METABOLIC SYNDROME AMONG POSTMENOPAUSAL SUDANESE WOMEN****Asim Alaaeldin Osman<sup>1\*</sup>, Ammar Mohammed Ali Mohammed<sup>2</sup>, Osman Sadig Bokhari<sup>3</sup>, Ahmed Mohamed Fadlalla<sup>4</sup>**<sup>1</sup>Department of Human Physiology, Faculty of Medicine, Gadarif University, Gadarif, Sudan.<sup>2</sup>Anatomist, Department of Rehabilitation and Physical Therapy, College Of Applied Medical Sciences, Shaqra University, Shaqra, Kingdom Of Saudi Arabia.<sup>3</sup>Department of Medicine, Faculty of Medicine, Gadarif University, Gadarif, Sudan.<sup>4</sup>Department of Physiology, Faculty of Medicine, International University of Africa, Khartoum, Sudan.**\*Correspondence for Author: Asim Alaaeldin Osman**

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**ABSTRACT****Background:** The metabolic syndrome defined as an assemblage of risk factors for cardiovascular diseases, and menopause is associated with an increase in metabolic syndrome prevalence. The aim of this study was to assess the prevalence of metabolic syndrome and its components among postmenopausal women in Northern state, Sudan.**Methods:** In this cross-sectional study in Northern state, Sudan, 290 postmenopausal women were investigated. Adult treatment panel 3 (ATP3) criteria were employed to classify subjects as having metabolic syndrome.**Results:** Total prevalence of metabolic syndrome among our subjects was 51.4%. Waist circumference, triglyceride, Systolic blood pressure, diastolic blood pressure and fasting blood glucose were significantly higher among women with metabolic syndrome while HDL cholesterol was significantly lower among women with metabolic syndrome (P-value<0.05). The study showed high abdominal obesity, hypertension and elevated fasting blood glucose are the most prevalent components of metabolic syndrome. There was a significant relationship between number of components of metabolic syndrome and waist circumference. **Conclusions:** Postmenopausal status was associated with an increased risk of metabolic syndrome. Therefore, to prevent cardiovascular disease there is a need to evaluate metabolic syndrome and its components from the time of the menopause.**KEYWORDS:** Menopause, Metabolic syndrome, Prevalence.**INTRODUCTION**

Metabolic syndrome is an assemblage of several factors including hypertension, dyslipidaemia, insulin resistance, obesity and glucose intolerance that increase subjects' risk to develop cardiovascular disease (CVD) and type 2 diabetes.<sup>[1,2]</sup> Diagnostic criteria for metabolic syndrome has been defined by the national cholesterol education program adult treatment panel III (ATP III), which is easily used for classifying patients.<sup>[3]</sup> It's estimated that almost 20-30% of the middle-aged population are affected by this syndrome <sup>[4]</sup> varies from 8 to 24% in males<sup>[5,6]</sup> and from 7 to 46% in females.<sup>[7,8]</sup>

Many cross-sectional studies have shown an increased risk of metabolic syndrome in postmenopausal women which varies from 32.6% to 41.5%.<sup>[9,10]</sup> Some studies show an increasing prevalence of metabolic syndrome in developing countries.<sup>[11]</sup> There is no data on the prevalence of metabolic syndrome among postmenopausal Sudanese women; we decided to establish a study in the northern state to determine the prevalence of metabolic syndrome and its components in postmenopausal women.

**MATERIAL AND METHODS**

This cross sectional study was conducted during the period of one year from March 2013 to March 2014 in the Northern state, Sudan. Cluster sampling technique-probability from local inhabitants was invited to participate in this study. 290 postmenopausal women (cessation of menstruation for 1 year) aged 45-70 years were the subject of this study. Exclusion criteria were considered as users of hormone replacement therapy and antidepressant drugs and the subjects with the following diseases or conditions: polycystic Ovarian Disease, Premature ovarian failure, adrenal insufficiency, thyroid gland diseases, a hysterectomy and an oophorectomy.

All the included subjects provided an informed consent. Data were collected by the principle investigator with help of general physician in outpatient departments. A questionnaire was completed for each patient including demographic information, menopausal status, medical history, reproductive history, drug history, family history, physical examination and clinical lab data.

Postmenopausal women were considered to have metabolic syndrome if they had any three or more of the following criteria, according to the ATP III criteria (2):

1. Abdominal obesity: waist circumference  $\geq 88$  cm.
2. Hypertriglyceridemia: serum TG level  $\geq 150$  mg/dl.
3. Serum HDL:  $< 50$  mg/dl.
4. High blood pressure: SBP  $\geq 130$  mmHg and/or DBP  $\geq 85$  mmHg or on treatment for hypertension.
5. High fasting glucose: serum glucose level  $> 110$  mg/dl or on treatment for diabetes.

Weight was measured, while subjects were minimally clothed without shoes, using digital scales. Height was measured in standing position using tape meter while the shoulder was in a normal position. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Waist circumference was measured at a level midpoint between the lower rib margin and the top of the iliac crest. Blood pressure of the patients was measured twice with a standard barometer in a sitting position, and the average blood pressure had been documented in the sheets.

Regarding blood samples, serum separated by centrifuging blood for 10 minutes at 3000RPM. Then, decanted into 5ml plain plastic tube, labelled with date, name, time of collection, identification number of the volunteer participating in this study and stored frozen at  $-4^{\circ}\text{C}$  for biochemical analysis. All participated women

were instructed to fast 10-12hours before blood collection, in order to obtain accurate results. The plasma lipids and fasting blood glucose were measured spectrophotometrically. Using kits from Bio system Company Costa Brava, 30, Barcelona (Spain).

All data were analyzed by SPSS version 20 (SPSS Inc, IBM). The continuous variables were reported as Mean  $\pm$  SD and categorical variables are presented as percentage. The distribution of continuous variables was assessed by Kolomogrov-Smirnov test and it demonstrated a normal distribution. P-value $<0.05$  was considered statistically significant.

## RESULTS

As 290 postmenopausal women were studied. Table 1 shows the baseline characteristics of these women with and without metabolic syndrome. The mean age of the subjects was  $53.69 \pm 7.454$  years. Total prevalence of metabolic syndrome among our subjects was 51.4%. Weight, body mass index, waist circumferences, systolic blood pressure, diastolic blood pressure and fasting blood glucose were significantly higher among women with metabolic syndrome (P-value $<0.05$ ). HDL-cholesterol was significantly lower among women with metabolic syndrome (P-value $<0.05$ ). There were no significant differences in the age, height and menopausal duration.

**Table 1: Baseline data of postmenopausal women with and without metabolic syndrome.**

Anthropometric variables*	Subjects with metabolic syndrome (n= 149) Mean $\pm$ SD	Subjects without metabolic syndrome (n=141) Mean $\pm$ SD	P value**
Age (years)	54.10 $\pm$ 7.398	53.32 $\pm$ 7.484	.372
Height (cm)	155.89 $\pm$ 6.761	156.08 $\pm$ 7.334	.823
Weight (cm)	78.28 $\pm$ 17.522	63.30 $\pm$ 15.233	.000
BMI	32.1835 $\pm$ 6.62674	25.6916 $\pm$ 5.86952	.000
WC (cm)	100.48 $\pm$ 11.356	86.77 $\pm$ 11.270	.000
TG (mg/dl)	209.49 $\pm$ 85.121	125.54 $\pm$ 51.188	.000
HDL (mg/dl)	80.35 $\pm$ 38.153	90.82 $\pm$ 31.591	.011
SBP (mmHg)	147.97 $\pm$ 22.556	125.70 $\pm$ 20.349	.000
DBP (mmHg)	84.44 $\pm$ 17.007	74.23 $\pm$ 13.192	.000
FBS (mg/dl)	162.16 $\pm$ 76.467	111.63 $\pm$ 50.696	.000
Menopausal duration (years)	8.56 $\pm$ 8.276	8.25 $\pm$ 8.710	.757

\*BMI: body mass index, WC: waist circumference, TG: triglyceride, HDL: high density lipoprotein, SBP: systolic blood pressure, DBP: diastolic blood pressure, FBS: fasting blood glucose.

\*\*P-value $<0.05$  was considered statistically significant.

The percentage of waist circumference $\geq 88$ cm, Triglyceride $\geq 150$ mg/dl, high density lipoprotein $< 50$ mg/dl, systolic blood pressure  $\geq 130$  mmHg/ diastolic blood pressure $\geq 85$  mmHg and fasting blood sugar $> 110$ mg/dl, were 70%, 49.7%, 16.9%, 61.7%, 32.8% , 32.8%, 54.5 respectively. The percentages of each metabolic syndrome components shown in Table 2.

**Table 2: Prevalence of the components of metabolic syndrome in postmenopausal women.**

Metabolic syndrome risk factors	Standard Value	Number (n=290)	Percentage %
WC	$\geq 88$	203	70
TG	$\geq 150$	144	49.7
HDL	$\leq 50$	49	16.9
SBP	$\geq 130$	179	61.7
DBP	$\geq 85$	95	32.8
FBS	$\geq 110$	158	54.5

As illustrated in table 3, there was significant positive correlation between waist circumference and the metabolic syndrome components namely TG, SBP, DBP and FBG and significant negative correlation with the HDL.

**Table 3: Correlation of waist circumference with the other component of the metabolic syndrome.**

parameters	statistics	TG	HDL	FBG	SBP	DBP
WC	Pearson correlation	.360	-.147	.314	.367**	.362**
	Sign (2 tails)	.000	.012	.000	.000	.000

## DISCUSSION

The overall prevalence of metabolic syndrome was 51.4% among postmenopausal women in the current study; other studies report a prevalence of metabolic syndrome near to our results. Studies of menopausal women in South Korea and western India shows a prevalence of 54.6% and 55% respectively<sup>[12]</sup>, in an agreement with our finding. Although there was a disagreement between our study and some other studies done in Austria, China, Germany, Iran and Canada, showed a prevalence of 32.6%, 37.34%, 36.1%, 31% and 29.6% respectively.<sup>[13]</sup> These differences in prevalence of metabolic syndrome in different studies can be due to different investigation methods of the syndrome (different investigation criteria), socioeconomic and environmental differences, genetic factors and lifestyle. In the present study, we founded that waist circumference, systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglyceride levels were significantly higher and HDL levels was significantly lower among postmenopausal women with metabolic syndrome in comparison to postmenopausal women without the syndrome. The most prevalent component of metabolic syndrome was abdominal obesity with a frequency of 70%, which in agreement with studies in north east of Iran.<sup>[14]</sup> Babol<sup>[15]</sup> and Argentina<sup>[16]</sup> about the most prevalent component of metabolic syndrome among postmenopausal women with MS. This is not exactly similar to the findings of other studies in Ecuador<sup>[17]</sup> with high TG level and in Korea.<sup>[12]</sup> Brazil.<sup>[16]</sup> and Iran<sup>[18]</sup> with low HDL-cholesterol level reported as the most prevalent component of metabolic syndrome. These differences may be due to genetic, ethnic and lifestyle differences in these countries. We founded a statistically significant positive correlation between waist circumference and the metabolic syndrome components namely TG, SBP, DBP and FBG and significant negative correlation with the HDL, which was agreement with study done by Marjani et al. in Gorgan<sup>[18]</sup> indicating that, one of the major causes of metabolic syndrome in the present study was abdominal adiposity. This finding agreement with studies which concluded that;

Individuals with greater degrees of central adiposity were expected to develop the metabolic syndrome more frequently than do those with a peripheral body fat distribution.<sup>[19]</sup> Abdominal obesity is a risk factor for cardiovascular disorders<sup>[20,21]</sup> and can cause metabolism abnormality and threaten human's health.<sup>[22]</sup> Therefore, it is necessary to reduce this risk among postmenopausal women with metabolic syndrome by changing the lifestyle leading to weight loss by a healthy diet and frequent physical activity.

In our study we founded that both systolic and diastolic blood pressure was higher among postmenopausal women with metabolic syndrome specially SBP which occur in 61.7% of the group with the syndrome. This consistence with the study carried out in Korea, which also showed a significantly high systolic blood pressure among postmenopausal women.<sup>[22]</sup> This might suggested that systolic blood pressure was a risk factor for CHD in postmenopausal women with metabolic syndrome that should considered. In the present study, increase in fasting blood glucose found among 54.5% of our subjects, this was consistent with the study carried out by Walton and colleges report an increase in FBS among postmenopausal women with metabolic syndrome.<sup>[23]</sup>

Finally, our findings show low HDL and high TG levels in postmenopausal women with metabolic syndrome, which was agreement with findings in studies done by Marjani et al, in Iran<sup>[18]</sup> and Figueiredo Neto et al, in Brazil.<sup>[16]</sup> There are controversial findings about menopausal effect on HDL<sup>[24,25]</sup>; and TG levels.<sup>[24]</sup> Our findings about high prevalence of hypertriglyceridemia and the reduction in HDL cholesterol among postmenopausal women with metabolic syndrome indicate a need to treat metabolic syndrome in postmenopausal women as a target for reducing cardiovascular risks with a special effort on lifestyle changing and daily diets.

**CONCLUSION**

High prevalence of metabolic syndrome among postmenopausal women in the northern state, Sudan, has been shown in this study. Abdominal obesity, hypertriglyceridemia and hypertension were the most prevalent components of metabolic syndrome among these patients; these components can lead to an increase in cardiovascular diseases. Interventions needed to modify these risk factors such as abdominal obesity, dyslipidaemia, and hypertension and glucose intolerance and reduce the risk of cardiovascular events. Therefore, it is important to have more efforts for lipid screening and educational programs to improve women's knowledge about a healthy lifestyle.

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