Prevalence of Metabolic Syndrome in Pre and Postmenopausal Women in Mogadishu-A Cross-Sectional Study

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Abstract

This study aims to assess the prevalence of metabolic syndrome in women living in Mogadishu, Somalia, pre and post-menopause. A cross-sectional study was conducted on a sample of 138 women who were receiving medical care in internal medicine clinics in three hospitals located in Mogadishu, Somalia. The sample consisted of women who were both pre- and postmenopausal. Participants were assessed for metabolic syndrome according to the criteria established by the National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III). The occurrence of metabolic syndrome in premenopausal women was 34% (47 out of 138), but in postmenopausal women, it was 100% (91 out of 91) ($p<0.001$). Postmenopausal women diagnosed with metabolic syndrome exhibited a notable rise in waist circumference, fasting blood glucose, blood pressure, and lipid levels. Conversely, their levels of HDL cholesterol experienced a significant reduction ($p<0.001$). Metabolic syndrome is often seen among women in Mogadishu, Somalia, both before and after menopause. Nevertheless, there is an increased probability of developing this condition in women who have reached menopause. Additional investigation is necessary to elucidate the underlying mechanisms that lead to the increased prevalence of metabolic syndrome in this particular population.

Keywords: *Premenopausal, postmenopausal, metabolic syndrome, Somalia.*

INTRODUCTION

Metabolic syndrome (MS) encompasses a collection of interconnected risk factors that have been linked to the progression and onset of cardiovascular disease and diabetes. These factors include abdominal obesity, hypertension, and imbalances in carbohydrate and lipid metabolism [1]. Excessive fat buildup, particularly in the abdominal region, has been linked to insulin resistance, dyslipidemia, and hypertension. Metabolic syndrome (MS) is identified by at least three of the components specified by the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII). Multiple studies have shown that people with MS are more prone to developing cardiovascular disease and type 2 diabetes [2].

Postmenopausal women are more likely to develop metabolic syndrome, which can be a precursor to type 2 diabetes and cardiovascular disease. It is crucial to evaluate and tackle the onset of MS after menopause due to the link between MS and metabolic changes related to abdominal fat accumulation [3].

MS is becoming increasingly prevalent worldwide, presenting a major challenge to public health. According to global estimates, the prevalence of this condition varies between 20% and 25%. Interestingly, individuals with MS have a threefold higher risk of experiencing heart attacks or strokes. Postmenopausal women, specifically, are at a higher risk, and research indicates that the syndrome's severity is worsened by a lack of estrogen [4].

There is a scarcity of data regarding the frequency of metabolic syndrome among Somali women. There is a notable lack of understanding in this area, as Somali women face a higher likelihood of developing metabolic syndrome due to their elevated rates of obesity and central obesity. Investigating the development of metabolic syndrome in pre-and postmenopausal Somali women holds significant importance for various reasons. First, it will assess the prevalence of metabolic syndrome in this population group. This information can provide valuable insights for public health interventions aimed at preventing and managing metabolic syndrome. Additionally, the study seeks to discover the various factors linked to metabolic syndrome in Somali women. This information can be utilized to create focused interventions for women who are at a heightened risk of developing the syndrome. Additionally, the study will offer valuable insights into the natural progression of metabolic syndrome among Somali women. This information can provide valuable insights for the development of long-term treatment and prevention strategies.

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MATERIALS AND METHODS

This study was conducted in Mogadishu, Somalia, from October 16, 2021, to July 16, 2022. Data were collected from pre-and post-menopausal women aged 45-55 who attended internal medicine clinics at Hodan District Hospitals, Kalkaal Hospital, and Somali Sudanese Specialist Hospital. It employed a cross-sectional design. Participants of 138 were recruited from internal medicine clinics at the two participating hospitals and assessed for metabolic syndrome based on established criteria.

Inclusion Criteria

All pre-and postmenopausal women aged 45-55 years who attended Kalkaal and Somali Sudanese hospitals and met the following criteria were eligible for participation:

- No current hormone replacement therapy
- No secondary hypertension

Exclusion Criteria

Individuals who met any of the following criteria were not included in the study:

- Current hormone replacement therapy
- Secondary hypertension

A set of questionnaires was created based on existing literature to gather information on sociodemographic data and menstrual history. Documentation was made of blood pressure, waist circumference, and body mass index (BMI). Waist circumference was measured by utilizing a non-stretchable measuring tape, while participants maintained an upright posture and breathed naturally. The measurement was obtained at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest. For this study, BMI was evaluated using the global cutoffs established by the World Health Organization (WHO). Nevertheless, it is acknowledged that there is an ongoing debate regarding the suitability of lower cutoffs in specific situations, such as those applied to Asian Indian populations. At present, there is insufficient evidence to validate varying thresholds for the Somali population. However, it is crucial to explore this subject in future research endeavors.

In addition, blood samples were collected from all participants after 8-12 hours of fasting. The blood samples underwent analysis for fasting blood glucose, triglycerides, total cholesterol, low-density lipoprotein (LDL), and high-density lipoprotein (HDL).

Approval for this study was obtained from the Institutional Review Board (IRB) of Jamhuriya University of Science and Technology (JUST), as well as the ethical committees of Kalkaal and Somali Sudanese hospitals. Before taking part in the study, all participants provided written informed consent. We will ensure that the data collected during this study remains confidential, and no participant's identity will be revealed in any way. The study followed the ethical guidelines outlined in the World Medical Association's Declaration of Helsinki.

RESULTS

Our study found that the average age of postmenopausal women was 54.19±8.454 years, while the average age of menopause was 45.41±2.428 years. The prevalence of Metabolic syndrome was found in 47 (34%) premenopausal participants and 91(100%) postmenopausal participants in Mogadishu, Somalia, respectively.

In Table **1**, the study reveals the prevalence of metabolic syndrome in pre- and postmenopausal women categorized by age. A robust and statistically significant correlation is observed between age and the risk of metabolic syndrome. The lowest prevalence is noted within the 40-45 age group, while the highest is between 50 and 55 years. Notably, a higher duration of menopause is associated with an increased risk of metabolic syndrome, with the majority observed in the 6-10 years postmenopausal category (**Table 1**).

Table **2** examines the prevalence of metabolic syndrome concerning blood pressure in pre- and postmenopausal women. Significant systolic and diastolic blood pressure increases are observed from premenopausal to

Table 1: Metabolic syndrome according to age and years since menopause.

Variables	Premenopausal Frequency	Percentage%	Postmenopausal Frequency	Percentage%
Age				
40-45	19	40.43%	-	-
46-49	28	59.57%	-	-
50-55	-	-	91	100%
Number of years since menopause				
< 2 years	-	-	8	8.79%
3 - 5 years	-	-	10	10.99%
6 - 10 years	-	-	56	61.54%
> 10 years	-	-	17	18.68%

Table 2: Metabolic syndrome and associated risk factors.

Variable	Premenopausal	Postmenopausal	p-value*
Systolic blood pressure (mmHg)	120.2 ± 20.2	136.4 ± 22.1	0.030*
Diastolic blood pressure (mmHg)	77.8 ± 11.8	92.5 ± 11.8	0.008*
Fasting plasma glucose (mg/dl)	88.7 ± 29.7	95.1 ± 38.2	0.393
2 h-post-prandial glucose (mg/dl)	115 ± 53.4	127.3 ± 70.2	0.011*
Waist circumference(cm)	87.6 ± 12.5	98.5 ± 12.3	0.197
Body mass index	27.6 ± 4.5	28.6 ± 4.7	0.932
Total Cholesterol (mg/dl)	209.8 ± 44.6	233.3 ± 50.6	< 0.001*
Triglycerides (mg/dl)	176.1 ± 98.9	207.8 ± 104.9	< 0.001*
LDL-C (mg/dl)	127.2 ± 38.2	142.5 ± 43.5	0.004*
HDL-C (mg/dl)	62.88±12.51	49.5 ± 10.8	0.121

*A p-value less than 0.05 is deemed to be statistically significant.

postmenopausal status. This table also presents the prevalence of metabolic syndrome in blood glucose levels in pre-and postmenopausal women. Postmenopausal individuals exhibit higher fasting and post-prandial glucose levels, signifying a more significant number of cases with elevated blood glucose levels. Our study had no statistically significant correlation; postmenopausal individuals exhibit higher waist circumference and body mass index values with a p-value of 0.197. While there is a minimal considerable difference in total cholesterol, LDL-C, and triglycerides between pre- and postmenopausal status, the values are notably higher in postmenopausal individuals ($p<0.001$).

DISCUSSION

The study findings reveal a strong and statistically significant link between age and the risk of developing metabolic syndrome in women who are both pre- and postmenopausal. Among women aged 40-45 years, the prevalence of metabolic syndrome was found to be lower, while it was higher among women aged 50-55 years. These findings align with earlier research conducted in India [5], which similarly observed a higher occurrence of metabolic syndrome in older women.

It was discovered that the duration of time since menopause is a notable factor contributing to the risk of metabolic syndrome. Postmenopausal women between 6-10 years after menopause experienced the highest risk of developing metabolic syndrome. This finding aligns with a study conducted in Ethiopia [6], which also discovered a strong statistical correlation between metabolic syndrome and postmenopausal duration.

Our study uncovered a notable rise in both systolic and diastolic blood pressure when transitioning from premenopausal to postmenopausal status. When examining the results of previous studies conducted in India [7], it was discovered that postmenopausal women had notably elevated systolic blood pressure levels. This finding is consistent with the high occurrence of hypertension that was observed. This aligns with prior research indicating a higher likelihood of hypertension in women after menopause. In our study, we discovered that postmenopausal women with metabolic syndrome had significantly higher levels of blood pressure, waist circumference, fasting blood glucose, total cholesterol, triglycerides, LDL-C, and HDL-C compared to premenopausal women with metabolic syndrome. The findings align with previous studies conducted in India [7], Nigeria [8, 9], and the United States [10].

Montecucco *et al.* emphasized the discovery of increased levels of pro-inflammatory cytokines, including C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α), in individuals diagnosed with metabolic syndrome. Adipose tissue dysfunction and hyperglycemia have been recognized as significant contributors to the inflammatory response. The authors highlighted the significance of comprehending the mechanisms involved in this inflammatory process to devise effective therapeutic approaches for the prevention and management of metabolic syndrome [11].

Embracing a healthy lifestyle, including engaging in regular physical activity and maintaining a balanced diet, plays a crucial role in preventing metabolic diseases during menopause. Some studies have suggested that hormone replacement therapy could have potential benefits, such as reducing total and LDL cholesterol levels and increasing HDL levels, as indicated by a meta-analysis [12,13].

Based on our research, it appears that postmenopausal women may face a greater likelihood of developing metabolic syndrome compared to premenopausal women. These changes are probably a result of the hormonal fluctuations that happen during menopause. These fluctuations can cause higher insulin resistance, the buildup of abdominal fat, and dyslipidemia.

LIMITATIONS AND STRENGTH

One limitation of this study is the relatively small number of participants in the sample. The generalizability of the findings to a broader population of pre-and postmenopausal women in Mogadishu, Somalia might be limited. In addition, the study was conducted in a hospital setting, which could introduce a selection bias since the participants may be more likely to have pre-existing medical conditions.

Another limitation of the study is its cross-sectional design. This suggests that it may not be appropriate to establish a definitive link between menopause and metabolic syndrome. Long-term studies are essential for gaining a deeper understanding of how menopause can potentially affect the risk of developing metabolic syndrome over time. The collection of alcohol and smoking history data was challenging as Somali women rarely engage in these practices and are hesitant to share such information openly.

Despite some limitations, the study provides valuable insights into the prevalence of metabolic syndrome among women in Mogadishu, Somalia, both before and after menopause. Postmenopausal women are found to be more susceptible to metabolic syndrome, according to the results. Further exploration is necessary to understand the underlying mechanisms and determine suitable treatments.

CONCLUSION

Our study revealed a concerning prevalence of metabolic syndrome among postmenopausal women in Mogadishu, Somalia. Metabolic syndrome was found to be more prevalent among postmenopausal women. In addition, postmenopausal women with metabolic syndrome showed an increase in waist circumference, higher fasting blood glucose levels, elevated blood pressure,

and raised triglyceride levels, along with decreased levels of HDL cholesterol. These metabolic irregularities indicate a higher likelihood of postmenopausal women developing metabolic syndrome. Further investigation is needed to better understand the high prevalence of metabolic syndrome among postmenopausal women in Mogadishu. It is crucial to implement targeted interventions to effectively tackle this health issue.

CONSENT FOR PUBLICATION

All participants provided written informed consent for the publication of the data collected in this study. The authors affirm that the participants' anonymity is preserved, and no identifying information is included in the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

Ahmed Muhammad Bashir: Conceptualization, methodology, writing – review & editing, supervision

Nur Rashid Ahmed: Writing – review & editing, supervision.

Mohamed Abdullahi Mohamed: Data curation, formal analysis and writing.

Abdirizak Ali Isse: Data curation, formal analysis, and writing original draft.

Hawa Osman Jimale: Data curation and formal analysis.

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