Impact of Metabolic Syndrome on Menopausal Symptoms among Postmenopausal Women

Eman Saber Shahat Taha, Mohamed Amr Mohamed Samy Khodair , Mariam Lotfy Mohamed, Mohamed Fawzy Elsayyed Ibrahim.

Departments of Obstetrics and Gynaecology, Faculty of Medicine, Suez Canal University, Ismailia, Egypt.

Abstract

Background: Menopause, defined as the full cessation of the menstrual cycle for more than twelve months, is a natural physiological phase that is directly induced by the decrease of estrogen levels. A group of conditions that consists of insulin resistance, central obesity, hypertension, and dyslipidemia is called metabolic syndrome. In older women, the menopause itself raises the risk of metabolic syndrome.

Aim: This study aimed to investigate the relationship between menopausal symptoms and metabolic syndrome in postmenopausal women.

Methods: A cross-sectional study that split menopausal women into two groups based on whether or not they had metabolic syndrome. The research was conducted at Suez Canal University Hospital's obstetrics and gynecology department. We used menopausal rating scale to assess menopausal symptoms in two women groups, one group consists of women with metabolic syndrome according to WHO definition while the other group was free.

Results: The median age was 57 years and 55 years among postmenopausal women without metabolic syndrome and those without respectively. BMI, systolic and diastolic blood pressure, fasting blood sugar, serum triglycerides and waist circumference were significantly higher among women with metabolic syndrome. While serum HDL had a significant lower level in women with metabolic syndrome. All somatic and psychological domains were significantly higher among women with metabolic syndrome compared to women without metabolic syndrome. Bladder symptoms were significantly higher among women with metabolic syndrome. There were 6.2% and 5.6% had asymptomatic, 91.9% and 94.4% had mild to moderate and 1.9% and 0 had severe to very severe menopausal symptoms among menopausal women with and without metabolic syndrome respectively. Psychological domain was significantly correlated with fasting blood sugar serum triglycerides and waist circumference. Total Menopause Rating Scale had significant positive correlation with systolic and diastolic blood pressure, waist circumference, fasting blood sugar

Corresponding author:
Eman Saber Shahat Taha
Department of obstetrics and gynecology, Faculty of Medicine, Suez Canal University, Kilo 4.5, Ring Road, Ismailia, Egypt, Postal code: 41111
Phone: +201094178738
Fax: +2 064 3210 111
Email: esaber242@gmail.com

and serum triglycerides. Using univariate binary logistic regression, only serum triglycerides had a significant association with severity of Menopause Rating Scale.

Conclusion: There was a significant increase in sleeping issues, irritability, depressed mood, anxiety, and problems voiding mental and physical exhaustion in cases with metabolic syndrome.

Keywords: Metabolic Syndrome, Menopausal Symptoms, Postmenopausal, Menopause Rating Scale.

Introduction

Menopause, defined as the full cessation of the menstrual cycle for more than twelve months, is a natural physiological phase that is directly induced by the decrease of estrogen levels. It produces a range of symptoms that fall into the categories of somatic, psychological, sexual, and vasomotor symptoms. Menopausal women may experience symptoms that are severe enough to interfere with their regular day-to-day activities. Menopausal symptoms' impact on the quality of life of has been extensively established (1).

Menopause typically occurs after the age of 45, however symptoms commonly begin to show up several years before. Middle-aged women's general health and well-being, as well as health issues associated to the menopause, are now serious health concerns. Menopausal women's health is gaining attention because, as life expectancy generally rises, more women are predicted to experience menopause for between 25% and 33% of their lives. In comparison to other nations, the age of menopause among Egyptian women was documented as 46.7 years (2,3).

Egyptian women respond and view menopause very differently than women in western nations, largely because of cultural and educational disparities. To estimate menopausal symptoms, numerous techniques have been developed for epidemiological and research objectives. The Menopause Rating Scale (MRS), one of these instruments, is suggested for use in clinical practise because it is made to rate a profile of symptoms in order to determine the severity of complaints connected to age and menopause. It has Arabic language validation (4).

The Quality-of-Life group defined as an individual's assessment of their place in life within the framework of their culture and values, as well as in connection to their aspirations, concerns, and standards (2).

Quality of life research after menopause has grown to be a crucial aspect of clinical treatment. In contrast to industrialized nations, limited information about menopausal symptoms and how they affect postmenopausal women's quality of life is accessible in developing nations (5).

A group of conditions that consists of insulin resistance, central obesity, hypertension, and dyslipidemia is called metabolic syndrome. It is linked to an elevated risk of having cardiovascular disease (CVD) and diabetes mellitus type 2 (T2DM) and in older women, the menopause itself raises the risk of MetS (6). This study aimed to investigate the relationship between menopausal symptoms and metabolic syndrome in postmenopausal women.

Methodology

This was a cross-sectional study that split menopausal women into two groups based on whether or not they had metabolic syndrome. We compared the two groups' menopausal symptom severity using a menopausal rating scale. The research was conducted at Suez Canal University Hospital's obstetrics and gynecology department.

Women who visited the Suez Canal University Hospital's obstetrics and gynecology clinic. The included were women over 45 going through menopause

as well as simple instances of hypertension and diabetes mellitus. Menopausal women with long-term medical or surgical problems, surgical menopause, early ovarian failure, menopausal women receiving ongoing psychiatric therapy, or both were excluded.

Sample Size justification

According to the following equation.

$n = (Z\alpha/2+Z\beta)2 *2*\sigma2 / (\mu1-\mu2)2$ (7)

, the estimated sample size was 322 participants (161 participants in each group) after adding of 20% for non-responders at 95% confidence ($Z\alpha/2 = 1.96$) and power 80% ($Z\beta = 0.84$). From Cengiz et al study, σ was 8.8, $\mu1$ was 19 and $\mu2$ was 16 in metabolic syndrome and control groups respectively (8).

Data collection tool:

We used menopausal rating scale to assess menopausal symptoms in two women groups, one group consists of women with metabolic syndrome according to World Health Organization (WHO) definition while the other group was free.

According to WHO criteria, metabolic syndrome is defined as abdominal obesity with a waist circumference of 88 cm for women, serum triglycerides of 150 mg/dL (1.7 mmol/L) or a medication treatment for elevated triglycerides, a serum high-density lipoprotein (HDL) cholesterol of <50 mg/dL (1.3 mmol/L) for women or a medication treatment for low HDL cholesterol, a fasting plasma glucose (FPG) of 100 mg/dL (5.6 mmol/L) or a medication treatment for elevated blood glucose, a blood pressure of 130/85 mmHg or a medication treatment for elevated blood pressure, and a metabolic syndrome definition for women.

Data from cases was collected according to MRS. MRS Arabic validated version will be used (9) women who are attending outpatient clinics at Suez Canal University (SCU) hospital from 9 pm to 12 pm will be offered to fill in data after explaining the items for them. Total MRS score ≤ 11, 12-35 and ≥ 36 are considered as asymptomatic, mild to moderate and severe to very severe, respectively (10,11).Then those eleven symptoms were arranged into subgroups as urogenital, psychological and physical. The researcher will help women who can't read by asking them direct questions.

The score of MSR was recorded and compared between the two groups.

Statistical analysis:

Version 26 of the SPSS program was used to statistically analyze and computerize the data that had been gathered. The Kolmogorov Smirnov test evaluated the normality of data. Tables and graphs were used to display the data when suitable. Frequencies and relative percentages were used to depict qualitative data. As said, the chi square test ($\chi2$) and Fisher Exact tests were employed to look into any associations between the qualitative variables. The mean and standard deviation in addition to median (minimum and maximum values) were used to express quantitative data. The difference between the two groups' quantitative non-parametric variables was computed using the Mann Whitney test. P-value < 0.05 denotes a significant difference, whereas P≥ 0.05 denotes a non-significant difference. Spearman correlation was used to assess the relation between two non-parametric variables while univariate logistic regression was used to find the relation between variables and severity of MRS.

Results

Upon comparing basic characteristics between the two studied groups, median of age was 57 years and 55 years among postmenopausal women without metabolic syndrome and those without respectively. More than half of both groups were married (53.4% and 51.9%). Twenty-nine percent and twenty-eight percent were illiterate among women with MetS and women

without. BMI, systolic and diastolic blood pressure, fasting blood sugar, serum triglycerides and serum triglycerides were significantly higher among women with metabolic syndrome. While serum HDL was significantly lower among women with metabolic syndrome (Table 1). All somatic and psychological domains were significantly higher among women with metabolic syndrome compared to women without metabolic syndrome. Bladder symptoms were significantly higher among women with metabolic syndrome while sexual problems and vaginal dryness showed no difference between both groups (Table 2). There were 6.2% and 5.6% had asymptomatic, 91.9% and 94.4% had mild to moderate and 1.9% and 0 had severe to very severe menopausal symptoms according to MRS among menopausal women with and without metabolic syndrome respectively (Figure 1). Somatic domain was positively correlated with systolic and diastolic blood pressure, waist circumference and serum triglycerides. While it was negatively correlated with HDL. Psychological domain was significantly correlated with fasting blood sugar serum triglycerides and waist circumference. While it was negatively significantly correlated with serum HDL. Urogenital domain was significantly positively correlated with systolic blood pressure and waist circumference. Total MRS had significant positive correlation with systolic and diastolic blood pressure, waist circumference, fasting blood sugar and serum triglycerides. In addition it had negative correlation with serum HDL (Table 3). Using univariate binary logistic regression, only serum triglycerides had a significant association with severity of MRS (Table 4).

Table 1. Comparing basic characteristics among the two studied groups.

Variable		**Postmenopausal without MetS (n= 161)**	**Postmenopausal with MetS (n= 161)**	**P value**
Age (years)	Median (min, max)	57 (46, 67)	55 (46, 67)	0.106[a]
Marital status	Married	86 (53.4%)	83 (51.9%)	0.962 [b]
	Widow	37 (23%)	40 (25%)	
	Divorced	26 (16.1%)	24 (15%)	
	Single	12 (7.5%)	13 (8.1%)	
Educational level	Illiterate	47 (29.2%)	46 (28.7%)	0.434 [c]
	Read and write	7 (4.3%)	2 (1.3%)	
	Primary	24 (14.9%)	24 (15%)	
	Preparatory	13 (8.1%)	16 (10%)	
	Secondary	35 (21.7%)	46 (28.7%)	
	High school	12 (7.5%)	10 (6.3%)	
	University	23 (14.3%)	16 (10)	
BMI	**Median (min, max)**	23.9 (18.2, 32.7)	24.9 (18.4, 33.5)	**0.020*** [a]
Systolic B.P (mmHg)	**Median (min, max)**	110 (90, 140)	130 (90, 160)	**<0.001*** [a]
Diastolic B.P (mmHg)	**Median (min, max)**	70 (50, 90)	85 (50, 110)	**<0.001*** [a]

Waist circumference (cm)	**Median (min, max)**	84.8 (67, 111)	91.2 (71, 113)	**<0.001*** [a]
FBS (mg/dl)	**Median (min, max)**	98 (64, 140)	114.5 (60, 166)	**<0.001*** [a]
Serum triglycerides (mg/dl)	**Median (min, max)**	134 (83, 290)	266.5 (143, 611)	**<0.001*** [a]
Serum HDL (mg/dl)	**Median (min, max)**	59 (29, 110)	35 (22, 81)	**<0.001*** [a]

a; Mann Whitney U test, b; Chi-square test, c; Fisher Exact test

*p is significant at <0.05

BMI; Body Mass Index, B.p; Blood pressure, FBS; fasting blood sugar, HDL; high density lipoprotein

Table 2. Comparing the MRS between the two studied groups.

Domain	Variable		Postmeno-pausal with-out MetS (n= 161)	Postmeno-pausal with MetS (n= 161)	P value
Somatic	Hot flushes, sweating	**Mean± SD**	1.5± 1.2	1.8± 1.2	**0.008***
		Median (Range)	1 (0, 4)	2 (0, 4)	
	Heart discomfort	**Mean± SD**	1.5± 1.2	1.7± 1.1	**0.034***
		Median (Range)	1 (0, 4)	2 (0, 4)	
	Sleeping problems	**Mean± SD**	1.9± 1.2	2.4± 1.2	**0.001***
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Muscle and joint problems	**Mean± SD**	1.9± 1.2	2.3± 1.3	**0.009***
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Total somatic score	**Mean± SD**	6.8± 2.6	8.2± 2.6	**<0.001***
		Median (Range)	7 (0, 12)	8 (1, 14)	
Psycho-logical	Depressive mood	**Mean± SD**	1.6± 1.2	2.1± 1.3	**0.002***
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Irritability	**Mean± SD**	2.1± 1.2	2.4± 1.1	**0.027***
		Median (Range)	2 (0, 4)	3 (0, 4)	
	Anxiety	**Mean± SD**	1.6± 1.3	1.9± 1.4	**0.026***
		Median (Range)	1 (0, 4)	2 (0, 4)	
	Physical and mental exhaustion	**Mean± SD**	2.0± 1.2	2.3± 1.2	**0.041***
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Total Psychological score	**Mean± SD**	7.4± 2.9	8.7± 3.5	**0.001***
		Median (Range)	7 (0, 16)	8 (1, 16)	

Urogenital	Sexual problems	**Mean± SD**	1.8± 1.2	2± 1.3	0.158
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Bladder problems	**Mean± SD**	1.4±1.3	1.7±1.3	**0.037***
		Median (Range)	1 (0, 4)	2 (0, 4)	
	Vaginal dryness	**Mean± SD**	1.8±1.3	1.8± 1.2	0.612
		Median (Range)	2 (0, 4)	2 (0, 4)	
	Total urogenital score	**Mean± SD**	5.1± 2.3	5.4± 2.6	0.099
		Median (Range)	5 (0, 11)	6 (0, 12)	
Total MRS score		**Mean± SD**	19.3± 4.9	22.3± 6.3	**<0.001***
		Median (Range)	20 (1, 29)	22 (4, 38)	

Mann Whitney U test, *p is significant at <0.05

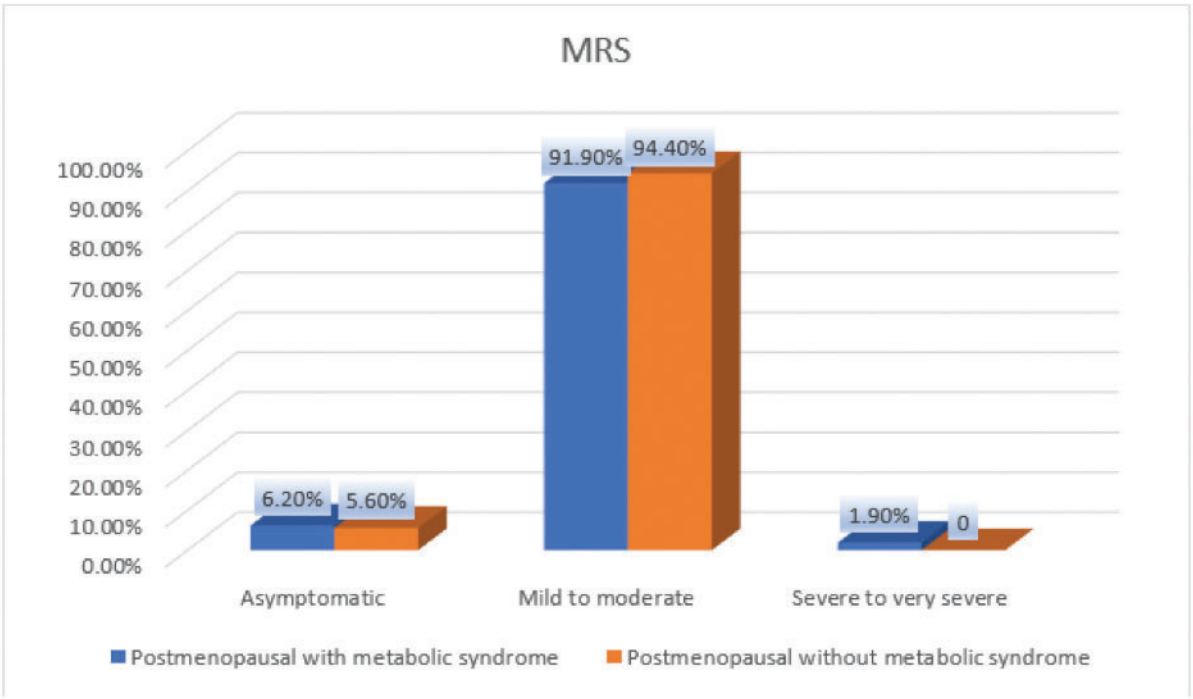

Figure 1. Menopausal rating score categories among the participants.

Table 3. Correlation between MRS domains and other variables.

		somatic subscale	**Psychological subscale**	**Urogenital subscale**	**MRS score**
Age (years)	R	-.022	-.062	-.025	-.065
	p.value	.689	.266	.649	.247
BMI	R	.105	-.049	.009	.027
	p.value	.060	.379	.868	.627
Systolic B.P mmHg	R	**.172**	.097	**.114**	**.184**
	p.value	**.002***	.083	**.040***	**.001***

Diastolic B.P $_{mmHg}$	R	**.210**	.105	.075	**.182**
	p.value	**.000***	.059	.181	**.001***
waist circumference $_{cm}$	R	**.180**	**.144**	**.138**	**.220**
	p.value	**.001***	**.009***	**.013***	**.000***
fasting blood sugar $_{mg/dl}$	R	.098	**.127**	.061	**.157**
	p.value	.078	**.023***	.278	**.005***
serum triglycerides $_{mg/dl}$	R	**.158**	**.121**	.045	**.158**
	p.value	**.005***	**.031***	.425	**.005***
serum HDL $_{mg/dl}$	R	**-.125**	**-.121**	-.013	**-.115**
	p.value	**.025***	**.030***	.809	**.040***

Spearman correlation, *p is significant at <0.05

BMI; Body Mass Index, B.p; Blood pressure, HDL; high density lipoprotein

Table 4. Univariate logistic regression for predicting Severity of MRS.

	Univariate analysis				
	EXP (B)	**Wald**	**Sig.**	**95% CI**	
				Lower	**Upper**
Serum HDL$_{mg/dl}$	0.134	2.240	0.899	0.782	1.033
Serum Triglycerides $_{mg/dl}$	1.009	6.250	**0.012***	1.002	1.017
Fasting blood sugar $_{mg/dl}$	1.053	3.166	0.075	0.995	1.114
waist circumference $_{cm}$	1.084	1.510	0.219	0.953	1.233
Systolic B.P $_{mmHg}$	1.037	1.269	0.260	0.974	1.104
Diastolic B.P $_{mmHg}$	1.062	1.326	0.250	0.959	1.177

Univariate logistic regression using severe MRS as a dependent variable.

*p is significant at <0.05

B.p; Blood pressure, HDL; high density lipoprotein

DISCUSSION

Metabolic syndrome (MetS) is a composite of factors that include hypertension, low HDL cholesterol, raised TG, elevated triglycerides, and insulin resistance. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII) guidelines state that a person may be classified as having MetS if they meet at least three of those requirements (12).

Numerous research studies have demonstrated a higher incidence of Metabolic Syndrome in postmenopausal women, with rates ranging from 16.9% to 69.0% across various demographic groups (5,13)

This study looked at the connection between menopausal symptoms and MetS in postmenopausal women with the goal of improving the quality of life for these people.

In this cross-sectional study, 322 menopausal women were split into two groups based on whether or not they had metabolic syndrome: There were 161 women with MetS and 161 women without MetS in total.

Evaluations of menopausal symptoms have been made utilising MRS. There are three subscales that make up this 11-item scale: somatic (hot flushes, heart palpitations,

insomnia, and problems with muscles and joints); psychological (irritability, anxiety, and depressive mood, mental and physical exhaustion); and urogenital (vaginal dryness, sexual issues, and bladder issues).

Every one of the 11 symptoms has a score ranging from "0" (no complaints) to "4". (very severe symptoms). The sum of the item scores for each of the three dimensions determines the composite score for that dimension. The sum of the three subscales' sum scores determines the final score (4).

According to the results of our investigation, there were statistically significant variations in waist circumference, diastolic blood pressure (BP), and systolic B.P. across the study groups. Women with MetS showed greater mean diastolic blood pressure, systolic blood pressure and waist circumference than non-MetS women.

In their study of 574 participants, Fernandez-Alonso et al. found that obesity and severe menopausal symptoms were linked (14).

Regarding FBS, serum triglycerides, and HDL, there were statistically significant variations between research groups in the current investigation. Compared to women without MetS, those with MetS had lower HDL and higher mean fasting blood sugar (FBS) and serum triglycerides.

Various studies have employed multiple scales to assess the intensity of menopausal symptoms (15).

The study found a difference with statistical significance in the total MRS score between the MetS and control groups. The study's overall somatic score showed a statistically significant difference between both MetS and the control groups.

The psychological subscale score in this study showed a statistically significant difference between the MetS and non-MetS groups, with the MetS group scoring higher. That being said, there was no statistically significant difference in the overall scores of the urogenital subscale between the two groups.

Research indicates that menopausal symptoms are far more common and severe when combined with Metabolic Syndrome and its predominant component, abdominal obesity (16).

Numerous research has shown a correlation between MetS and psychological symptoms including depression and anxiety, although the findings are debatable. According to research by Skilton et al., among 1,598 men and women, MetS was linked to a higher incidence of depression but not anxiety, and the number of MetS components rose as depression levels rose but not anxiety levels did (17).

Furthermore, compared to women without vasomotor complaints, women who report hot flashes have an undesirable CVD risk profile, according to Gast et al (18).

Vasomotor symptoms are also linked to a higher risk of cardiovascular illnesses (12). For the previous reasons, there appears to be a connection between menopausal symptoms and MetS, but the number of papers examining the connection is few. Serum estrogen concentration is greater in obese postmenopausal individuals than in normal weight individuals (6).

When Lee et al. evaluated both groups with and without MetS, they found that while there was a difference proved statistically between the groups' somatic symptom scales and overall MRS scores, there was no significant difference between both urogenital and psychological symptom subscales (16).

In contrast to the results of the Chedraui et al. study, they said that the prevalence of depressive symptoms was lower in their MetS cases (19).

In our study, the MetS group experienced bladder issues more frequently than the non-MetS group.

The group with MetS in the Lee et al. trial

experienced more hot flashes and sweats on a higher frequency and scored higher on somatic symptoms than the group without MetS. We reasoned that the increase in vasomotor symptoms was caused by an increase in body fat, obstruction of heat dissipation, and drop in core body temperature since women with MetS have greater levels of body fat and abdominal adiposity (16).

We found that those with MetS had a higher prevalence of sleep issues. Two long-term cohort studies have demonstrated that sleep disturbances are more prevalent in the early stages of menopause (20,21).

Additionally, it is well recognized that symptoms of depression and anxiety can cause problems with sleep (22).

According to this study, the waist circumference (WC), systolic-diastolic blood pressure, serum lipids, and overall MRS score were all positively correlated.

Much like in the work of Cengiz et al., there was a positive correlation discovered between the AC, TG, total MRS score, and systolic-diastolic blood pressure. Nevertheless, no meaningful correlations between the FPG, HDL, and overall MRS scores were discovered (8).

Thurston et al. found that a higher level of total and subcutaneous abdominal adiposity were linked to a higher risk of hot flashes in the Study of Women's Health across the Nation Heart Study (SWAN) (13).

In accordance with the findings of the Cengiz et al. study, which showed a substantial positive association between the psychological subscale and serum triglycerides, we also discovered a significant link between the psychological subscale and serum triglycerides (8).

Abdominal obesity has been demonstrated by Chedraui et al. to be a substantial risk factor for joint discomfort, depression, and hot flashes (19).

According to a Gold et al. study, hot flashes are unexpectedly less common in obese people, but they also tend to occur more frequently in these circumstances (23).

Additionally, a strong association was discovered between the WC and the urogenital subscale.

Likewise, the Cengiz et al. investigation discovered a strong positive connection between the urogenital subscale and abdomen circumference (8).

The univariate logistic regression model for variables associated with severe MRS scores was ultimately discovered by this investigation. We discovered a strong correlation between the total MRS score and the triglycerides.

In a similar vein, TG levels were shown to be strongly correlated with the total psychological symptom subscale in the Cengiz et al. study's multivariate analysis (8), but Lee and colleagues found TG levels to be correlated with the total somatic symptom subscale (16).

We believe that the various results documented in the literature stem from demographic variations, including differences in socioeconomic status, ethnicity, culture, and lifestyle.

It is believed that urogenital symptoms, such as difficulties voiding and having sexual relations, worsen throughout the postmenopausal stage. Studies, however, indicate that there is little connection between MetS and urogenital symptoms (8).

MetS has been demonstrated by Ponholzer et al. to be a separate risk factor for decreased sexual desire (24).

According to a study by Esposito and Giugliano, premenopausal individuals with MetS had a significantly lower mean Female Sexual Function Index (FSFI) score (25).

Lee et al., however, have demonstrated that there is no connection between MetS and urogenital symptoms or sexual abnormalities (16).

In a multivariate linear regression analysis, Laudisio et al. found that MetS was connected with the GDS score in women (95 percent CI, 0.14–4.14; p=0.036), but not in men (95 percent CI, -3.17 to -1.49; p = 0.476) (26).

When age, gender, education level, and physical activity were taken into account in the models, Hildrum et al. found no correlation between MetS and anxiety or depression (27).

The study findings indicate that there was no significant difference in sexual issues or vaginal dryness between patients with and without MetS. However, there was a substantial rise in voiding problems among patients with MetS. We believe that our nation's cultural has a major role in this outcome.

The cross-sectional form of the research and the failure to account for the cultural differences among the research groups are the two main shortcomings of this study.

We concluded by demonstrating that, although there was no difference between the patients with and without MetS regarding the vasomotor symptoms, there was a significant increase in sleeping issues, irritability, depressed mood, anxiety, problems voiding and mental and physical exhaustion in cases with MetS. Furthermore, there may be a correlation between higher overall urogenital scores and higher WC values.

List of abbreviations

MetS: Metabolic syndrome

MRS: Menopause Rating Scale

CVD: cardiovascular disease

T2DM: diabetes mellitus type 2

WHO: World Health Organization

HDL: high-density lipoprotein

FPG: fasting plasma glucose

SCU: Suez Canal University

NCEP ATPIII: National Cholesterol Education Program Adult Treatment Panel III

BP: blood pressure

FBS: fasting blood sugar

WC: waist circumference

Ethics approval and consent to participate

All participants agreed for participation

Consent for publication

All authors agreed for publication

Availability of data and material

All data are available.

Competing interests

No

Funding

Not applicable

Authors' contributions

All authors contributed in all parts of the research.

Acknowledgements

Great thanks to all women who participated in this research.

References

1. Das A, Sunny AM, Paul A, Anto A, Abraham BT. A research to spot the association between menopausal symptoms and metabolic syndrome in post-menopausal women in a tertiary care hospital. Curr Med Res Pract 2021;11(3):113.
2. Dutra da Silva GM, Rolim Rosa Lima SM, Reis BF, Macruz CF, Postigo

S. Prevalence of hypoactive sexual desire disorder among sexually active postmenopausal women with metabolic syndrome at a public hospital clinic in brazil: a cross-sectional study. Sex Med 2020;8(3):545–53.

3. Chedraui P, Pérez-López FR. Metabolic syndrome during female midlife: what are the risks? Climacteric 2019;22(2):127–32.
4. Ibrahim ZM, Ahmed WAS, El-Hamid SA. Prevalence of menopausal related symptoms and their impact on quality of life among Egyptian women. Clin Exp Obstet & Gynecol 2015;42(2):161–7.
5. Yoldemir T, Erenus M. The prevalence of metabolic syndrome in pre- and post-menopausal women attending a tertiary clinic in Turkey. Eur J Obstet & Gynecol Reprod Biol 2012;164(2):172–5.
6. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and Management of the Metabolic Syndrome. Circulation 2005;112(17):2735–52.
7. Dawson B, Trapp RG. Basic and Clinical Biostatistics. 3 [sup] rd ed. 2001.
8. Cengiz H, Kaya C, Suzen Caypinar S, Alay I. The relationship between menopausal symptoms and metabolic syndrome in postmenopausal women. J Obstet Gynaecol (Lahore) 2019;39(4):529–33.
9. Sweed HS, Elawam AE, Nabeel AM, Mortagy AK. Postmenopausal symptoms among Egyptian geripausal women. East Mediterr Heal J 2012;18(3):213–20.
10. Ahsan M, Mallick AK, Singh R, Prasad RR. Assessment of menopausal symptoms during perimenopause and postmenopause in tertiary care hospital. J Basic Clin Reprod Sci 2015;4(1):14–9.
11. Elsabagh EEM, Abd Allah ES. Menopausal symptoms and the quality of life among pre/post menopausal women from rural area in Zagazig city. Life Sci J 2012;9(2):283–91.
12. Cagnacci A, Cannoletta M, Caretto S, Zanin R, Xholli A, Volpe A. Increased cortisol level. Menopause 2011;18(3):273–8.
13. Thurston RC, Sutton-Tyrrell K, Everson-Rose SA, Hess R, Matthews KA. Hot flashes and subclinical cardiovascular disease: findings from the Study of Women's Health Across the Nation Heart Study. Circulation 2008;118(12):1234–40.
14. Fernández-Alonso AM, Cuadros J l, Chedraui P, Mendoza M, Cuadros ÁM, Pérez-López FR. Obesity is Related to Increased Menopausal Symptoms among Spanish Women. Menopause Int 2010;16(3):105–10.
15. Freeman EW, Sammel MD, Lin H, Liu Z, Gracia CR. Duration of menopausal hot flushes and associated risk factors. Obstet Gynecol 2011;117(5):1095–104.
16. Lee SW, Jo HH, Kim MR, Kwon DJ, You YO, Kim JH. Association between menopausal symptoms and metabolic syndrome in postmenopausal women. Arch Gynecol Obstet 2011;285(2):541–8.
17. Skilton MR, Moulin P, Terra J-L, Bonnet F. Associations Between Anxiety, Depression, and the Metabolic Syndrome. Biol Psychiatry 2007;62(11):1251–7.
18. Gast G-CM, Grobbee DE, Pop VJM, Keyzer JJ, Wijnands-van Gent CJM, Samsioe GN, et al. Menopausal Complaints Are Associated With Cardiovascular Risk Factors. Hypertension 2008;51(6):1492–8.
19. Chedraui P, Hidalgo L, Chavez D, Morocho N, Alvarado M, Huc A. Menopausal symptoms and associated risk factors among postmenopausal women screened for the metabolic syndrome.

Arch Gynecol Obstet 2006;275(3):161–8.

20. DENNERSTEIN L, DUDLEY EC, HOPPER JL, GUTHRIE JR, BURGER HG. A Prospective Population-Based Study of Menopausal Symptoms. Obstet & Gynecol 2000;96(3):351–8.
21. Kravitz HM, Ganz PA, Bromberger J, Powell LH, Sutton-Tyrrell K, Meyer PM. Sleep difficulty in women at midlife: a community survey of sleep and the menopausal transition *. Menopause 2003;10(1):19–28.
22. Freedman RR, Roehrs TA. Sleep disturbance in menopause. Menopause 2007;14(5):826–9.
23. Gold EB, Colvin A, Avis N, Bromberger J, Greendale GA, Powell L, et al. Longitudinal analysis of the association between vasomotor symptoms and race/ethnicity across the menopausal transition: study of women's health across the nation. Am J Public Health 2006;96(7):1226–35.
24. Ponholzer A, Temml C, Rauchenwald M, Marszalek M, Madersbacher S. Is the metabolic syndrome a risk factor for female sexual dysfunction in sexually active women? Int J Impot Res 2007;20(1):100–4.
25. Esposito K, Giugliano D. Obesity, the metabolic syndrome, and sexual dysfunction. Int J Impot Res 2005;17(5):391–8.
26. Laudisio A, Marzetti E, Pagano F, Pozzi G, Bernabei R, Zuccalà G. Depressive Symptoms and Metabolic Syndrome: Selective Association in Older Women. J Geriatr Psychiatry Neurol 2009;22(4):215–22.
27. Hildrum B, Mykletun A, Dahl AA, Midthjell K. Metabolic syndrome and risk of mortality in middle-aged versus elderly individuals: the Nord-Trøndelag Health Study (HUNT). Diabetologia 2009;52(4):583–90.