PREVALENCE OF METABOLIC SYNDROME IN PERI AND POSTMENOPAUSAL WOMEN AGED 40- 65 YEARS IN A TERTIARY CARE CENTRE

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ABSTRACT

Metabolic syndrome (MetS) is a constellation of interrelated risk factors of metabolic origin—metabolic risk factors—that appear to directly promote the development of atherosclerotic cardio-vascular disease (ASCVD). Menopausal transition with its incidental hormonal changes is considered to contribute to the development of MetS. This was a hospital based cross sectional descriptive study conducted in the Obstetrics and Gynaecology department of Nepal Medical College Teaching Hospital, Attarkhel, Gokarneshwor-8, Kathmandu, from the 1st of September 2023 till the 29th of February 2024 after clearance from the IRC (Ref. No: 56-080/081). Convenience sampling was used among women who fulfilled the inclusion criteria. The aim of the study was to determine the prevalence of MetS among the peri and postmenopausal women and to determine which component of the diagnostic criteria of MetS was more strongly associated with MetS in our population. Women were evaluated to have MetS using both the International Diabetes Federation (IDF) and the National Cholesterol Education Program- Adult Treatment Panel III (NCEP-ATPIII criteria). The prevalence of MetS by the IDF criteria was 54% among the perimenopausal women and 61% among the postmenopausal women. Similarly, the prevalence of MetS according to NCEP-ATPIII was 53.5% among the perimenopausal and 65% among the postmenopausal women. All the MetS diagnostic markers showed a strong correlation with MetS ($p<0.001$). The prevalence of MetS is high in our population by both the IDF and NCEP-ATP III criteria, being higher in the postmenopausal population, though not statistically significant.

KEYWORDS

Metabolic syndrome (MetS), perimenopausal, postmenopausal, prevalence, women

***Received on**: May 05, 2024*
***Accepted for publication**: August 02, 2024*

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DOI: https://doi.org/10.3126/nmcj.v26i3.69879

INTRODUCTION

Metabolic Syndrome (MetS) refers to the presence of a cluster of risk factors specific for cardiovascular disease. The syndrome identifies individuals at an increased risk of Atherosclerosis and Cardiovascular Disease (ASCVD).[1] Cardiovascular disease (CVD) is the primary cause of death in women of westernized countries, with more than one in two women dying from CVD.[2] Studies have shown that the South Asians are inherently at an increased risk for coronary artery disease.[3] The incidence of MetS has increased in other South Asian countries as well as in India.[4] Studies from Nepal are lacking in this regard.

Menopausal transition can last several years and can affect physical, emotional, mental and social well-being. A hallmark of menopause transition is the dramatic reduction of the estradiol levels.[5] The lack of estrogen causes significant changes in the woman's body. In many women features of the metabolic syndrome (abdominal adiposity, insulin resistance, and dyslipidemia) emerge with estrogen deficiency.[2] These changes can be slowed down by taking various precautions and identifying women at increased risk. One important health risk is MetS which if identified early can be worked upon.

MATERIALS AND METHODS

A hospital based cross sectional descriptive study was conducted in the Obstetrics and Gynaecology department of Nepal Medical College Teaching Hospital, Attarkhel, Kathmandu from the 1st of September 2023 till the 29th of February 2024. The sample size was estimated to be 196, anticipating that the prevalence of MetS among postmenopausal women is 46%[6] with a 5% level of significance, 7% absolute error margin, and a 95% confidence interval.

All women of the age group of 40 to 65 years with an intact uterus and at least one ovary; and have used no sex steroid hormone therapy in the preceeding 3 months were considered for the study. Informed consent was taken from the women. Women who were pregnant and who refused to give consent were excluded from the study. The study was conducted with the aim to determine the prevalence of MetS among the peri and postmenopausal women and to determine which component of MetS is more strongly associated with MetS in our population.

The women were divided into two groups: a pre-menopausal group composed of women who are still having either regular or irregular menstrual cycles and a post-menopausal group composed of women who have not experienced menstrual cycles in more than one year, according to the definition of the guideline on the diagnosis and management of menopause.

A thorough history was taken regarding the presence of hot flashes, urogenital symptoms, the menstrual history. The intake of any long term medications were noted (anti hypertensives, statins) in the history sheet. Women's smoking habits were mentioned in the history sheet. Drinking habits of women were noted. A general, systemic and gynaecological examination was done. The anthropometry [height, weight, abdominal circumference (AC), hip circumference (HC) and body mass index (BMI)[6] was performed. The blood pressure was recorded in the sitting position on the left arm after a 10 minutes' rest. The weight was recorded (in kilograms) with the patient barefoot and wearing light clothes on a digital weighing machine. The height was measured in centimeters with the patient standing bare feet on the stadiometer. The AC was measured at a level midway between the bottom of the ribcage and superior margin of the iliac crests during inspiration and the HC at the maximal diameter of the buttocks (both in cms).

Venous blood was collected in the morning after an overnight fasting of at least 8 hours. Blood was collected for fasting blood sugar and fasting lipid profile (cholesterol, triglycerides, HDL-C and LDL-C). Women were evaluated to have MetS using both the International Diabetes Federation (IDF) and the National Cholesterol Education Program- Adult Treatment Panel III (NCEP-ATPIII) criteria and it was mentioned in their case sheet.

According to the IDF criteria for Asian Indians, MetS is diagnosed in patients with central obesity (WC ≥80 cm) plus any two of the following factors: a) FBS ≥100 mg/dl or known case of diabetes mellitus, b) BP ≥130/85 mmHg or known hypertensive, c) TG ≥150 mg/dl, d) HDL <50 mg/dl.[7]

The NCEP-ATPIII criteria for the diagnosis of MetS requires the presence of any three in five of the following criteria a) abdominal obesity defined as WC ≥80 cm b) FBS ≥100 mg/dl or known case of diabetes mellitus, c) BP ≥130/85 mmHg or known hypertensive, d) TG ≥150 mg/dl, e) HDL <50 mg/dl. When applying NCEP- ATP III criteria in Asian countries, lower waist circumferences, as defined by IDF for these populations, appears to be appropriate. The same waist criteria (≥88 cm) is reasonable for Asians living in the United States. The blood sugar cut-off in 2001 was 110 mg/dl, but modified in 2004 to 100 mg/dl.[1]

All data collected was entered into the master chart and statistical analysis was done on IBM SPSS 18 version. Descriptive statistics was calculated to describe the characteristics of the women. Chi-square test was used to establish association between MetS with age group, ethnicity and BMI. Also the association of the various components of MetS in our population was calculated using chi-square. Odd's ratio was calculated for the same.

RESULTS

A total of 265 women were considered for the study, but only 201 women participated in the study, the rest were excluded since they failed to do their blood investigations. Maximum (71.6%) women were in their perimenopause. Eighty six percent of women were multipara, majority (73.1%) were homemakers and most (42.8%) had regular cycles. Most (57.7%) of the women were *Tibeto-Burman* (Table 1).

Table 1: Characteristics of women

Characteristic		n	%
Age	Perimenopause	144	71.6
	Postmenopause	57	28.3
Para	Nullipara	5	2.5
	Primipara	24	11.9
	Multipara	172	85.6
Education	Illiterate	85	42.3
	Literate	74	36.8
	Primary	26	12.9
	Secondary	12	6.0
	Tertiary	4	2.0
Occupation	Homemaker	147	73.1
	Farmer	27	13.4
	Teacher	1	5
	Other	26	17.4
Menstruation	Regular	86	42.8
	Irregular	57	28.4
	Pause <5 years	27	13.4
	Pause 5-10 years	18	9.0
	Pause >10 years	13	6.5
Smoker	Never	174	86.6
	Past	11	5.5
	Present	16	8.0
Alcohol	Never	158	78.6
	Social	33	16.4
	Light	3	1.5
	Moderate drinker	5	2.5
	Heavy drinker	2	1.0
Physical activity	Yes	55	27.4
	No	146	72.6
Ethnicity	*Indo-Aryan*	85	42.3
	Tibeto-Burman	116	57.7

The prevalence of MetS by the IDF criteria was 54.0% among the perimenopausal women and 61.0% among the postmenopausal women. Similarly, the prevalence of MetS according to NCEP-ATPIII was 53.5% among the perimenopausal and 65.0% among the postmenopausal women (Table 2).

The prevalence of MetS was 62.4% and 63.5% in the *Indo-Aryan* ethnicity according to IDF and NCEP- ATP III criteria respectively, and the prevalence of MetS in the *Tibeto-Burman* ethnicity was 50.9% by IDF and 51.7% by NCEP-ATP III (Table 3). Higher BMI (revised BMI for South -Asians) was associated with MetS, which was statistically significant (Table 4).

All the MetS diagnostic markers showed a strong correlation with MetS ($p<0.001$). According to the IDF criteria, raised blood sugar/ preexisting diabetes was the most frequent component, and by the NCEP- ATP III criteria, it was raised blood sugar/ preexisting Diabetes Mellitus (DM), followed by raised BP/preexisting hypertension (HTN) (Table 5).

DISCUSSION

The overall prevalence of MetS in this study was 55.7% (112) by the IDF criteria and 56.7% (114) by the NCEP- ATP III criteria. This was high as compared to other similar studies. In the study done by Marchi *et al*[8] in Brazil, MetS was observed in 18.5% of women.

Table 2: Prevalence of metabolic syndrome in peri and post-menopausal women

Age group		MS-IDF			MS-NCEP-ATPIII		
		Yes	No	P value	Yes	No	P value
Perimenopausal	n	77	67	0.308	77	67	0.140
	%	53.5%	46.5%		53.5%	46.5%	
Postmenopausal	n	35	22		37	20	
	%	61.4%	38.6%		64.9%	35.1%	

Table 3: Association of metabolic syndrome with ethnicity

Ethnicity		MS-IDF			MS-NCEP-ATPIII		
		Yes	No	P value	Yes	No	P value
Indo-Aryan	n	53	32	0.105	54	31	0.095
	%	62.4%	37.6%		63.5%	36.5%	
Tibeto-Burman	n	59	57		60	56	
	%	50.9%	49.1%		51.7%	48.3%	

Table 4: Association of metabolic syndrome with BMI%							
Body Mass Index		**MS-IDF**			**MS-NCEP-ATPIII**		
		Yes	**No**	**P value**	**Yes**	**No**	**P value**
Underweight	n	0	01	<0.001	0	01	<0.001
	%	0%	100%		0%	100	
Normal BMI	n	8	24		10	22	
	%	25%	75%		31.2%	68.8%	
Overweight	n	9	24		9	24	
	%	27.3%	72.7%		27.3%	72.7%	
Obesityi number	n	57	30		57	30	
	%	65.5%	34.5%		65.5%	34.5%	
Obesity ii number	n	31	10		31	10	
	%	75.6%	24.4%		75.6%	24.4%	
Obesity iii number	n	5	0		5	0	
	%	100%	0%		100%	0%	

Table 5: Association of components of mets with metabolic syndrome										
Parameters			**MS-IDF**				**MS-NCEP-ATPIII**			
			Yes	**No**	**P value**	**Or**	**Yes**	**No**	**P value**	**OR**
AC	Yes	n	A DIAGNOSTIC CRITERIA				111	63	<0.001	14.9
		%					63.8%	36.2%		
	No	n					3	24	<0.001	
		%					11.1%	88.9%		
↑ BP/HTN	Yes	n	78	16	<0.01	10.46	79	15	<0.001	10.83
		%	83%	17%		84%	16%			
	No	n	34	73		32.7%	35	72		
		%	31.8%	68.2%			67.3%			
↑BS/DM	Yes	n	57	08	<0.001	10.49	59	06	<0.001	14.82
		%	87.7%	12.3%		90.8%	9.2%			
	No	n	55	81		40.4%	55	81		
		%	40.4%	59.6%			59.6%			
↑ TG	Yes	n	52	11	<0.001	6.14	54	09	<0.001	7.8
		%	82.5%	17.5%		85.7%	14.3%			
	No	n	60	78		43.5%	60	78		
		%	43.5%	56.5%			56.5%			
↓ HDL	Yes	n	101	62	<0.001	3.99	103	60	<0.001	4.2
		%	62%	38%		63.2%	36.8%			
	No	n	11	27		28.9%	11	27		
		%	28.9%	71.1%			71.1%			

A total of 54% of women in the perimenopausal age had MetS according to both the IDF and NCEP- ATP III criteria, which is much higher than that reported by other studies in the same group (9.4%, 37%, 41.67% and 20%).[8-10,16]

A total of 61.4% of women in the postmenopausal women had MetS according to IDF criteria and 64.9% by NCEP-ATP III criteria, which was similar to the result obtained by Neto *et al*[8] (61.5% by IDF criteria) and Bharath *et al*[10] (62.5% by ATP III).[10] But this value was higher than that reported by other similar studies (22.2%, 44.4%, 46%, 57.8%).[8- 10,16]

The prevalence was more in the postmenopausal women, even though it wasn't statistically significant, the results were similar to other studies.[8-10,12,13,16] The prevalence of MetS was slightly more in the Indo-aryan ethnicity as compared to the Tibeto-burmese ethnicity (62.4% Vs 50.9% by IDF and 63.5% Vs 51.7% by NCEP-ATP III), but the association between MetS and ethnicity was statistically not significant.

The most widely recognized of the metabolic risk factors are atherogenic dyslipidemia, elevated blood pressure, and elevated plasma glucose.[1] In the Brazilian study by Marchi *et al*,[8] the prevalence of MetS components was higher in postmenopausal women with a statistically significant association for low HDL levels, hypertension and high fasting glucose levels.

Table 6: Association of mets with women's characteristics; IDF criteria							
Parameter			**Peri-Menopause (144)**		**Peri-Menopaues (57)**		**P-value**
			Yes	**No**	**Yes**	**No**	
Occupation	Homemaker	n	61	46	25	15	0.132
		%	57%	43%	62.5%	37.5%	
	Farmer	n	4	10	08	05	
		%	28.6%	71.4%	61.5%	38.5%	
	Others	n	12	11	2	2	
		%	52.2%	47.8%	50%	50%	
Physical activity	Yes	n	18	17	15	5	0.781
		%	51.4%	48.6%	75%	25%	
	No	n	59	50	20	17	
		%	54.1%	45.9%	54.1%	45.9%	
Smoker	Yes	n	06	03	04	03	0.412
		%	66.7	33.3%	57.1%	42.9%	
	No	n	71	64	31	19	
		%	52.6%	47.4%	62%	38%	
Alcohol	Yes	n	15	12	13	03	0.810
		%	55.6%	44.4%	81.2%	18.8%	
	No	n	62	55	22	19	
		%	53%	47%	53.7%	46.3%	

Table 7: Association of MetS with women's characteristics; NCEP-ATPIII criteria							
Parameter			**Peri-menopause (144)**		**Peri-menopause (57)**		**P value**
			Yes	**No**	**Yes**	**No**	
Occupation	Homemaker	n	61	46	27	13	0.132
		%	57%	43%	67.5%	32.5%	
	Farmer	n	4	10	8	5	
		%	28.6%	71.4%	61.5%	38.5%	
	Others	n	12	11	2	2	
		%	52.2%	47.8%	50%	50%	
Physical activity	Yes	n	18	17	15	5	0.781
		%	51.4%	48.6%	75%	25%	
	No	n	59	50	22	15	
		%	54.1%	45.9%	59.5%	40.5%	
Smoker	Yes	n	06	03	04	03	0.412
		%	66.7%	33.3%	57.1%	42.9%	
	No	n	71	64	33	17	
		%	52.6%	47.4%	66%	34%	
Alcohol	Yes	n	15	12	13	03	0.810
		%	55.6%	44.4%	81.2%	18.8%	
	No	n	62	55	24	17	
		%	53%	47%	58.5%	41.5%	

In this study, all the MetS diagnostic markers showed a strong correlation with MetS ($p<0.001$) and according to the IDF criteria, raised blood sugar/ preexisting diabetes was the most frequent component, followed by raised BP or preexisting hypertension and raised triglyceride levels and last being reduced HDL levels. And by the NCEP-ATP III criteria, in descending order of association was raised blood sugar/ preexisting DM, followed by raised BP/preexisting HTN, raised TG and last being reduced HDL.

In the Thai study done by Indhavivadhana *et al*,[14] the three most common components of the diagnostic critera found in the study population were central obesity (84.4%), high blood pressure or hypertension treatment (75.3%), and low HDL-C or dyslipidemia treatment (71.4%). Approximately 30% of the participants with metabolic syndrome had more than three components of diagnostic criteria, whereas approximately 60% of those without metabolic syndrome had one or two components of the diagnostic criteria.

According to IDF definition, in the women in menoapuse tranisition, among the components of MetS, hypertension was the most frequent

diagnostic feature followed by serum HDL Cholesterol and waist circumference in the study done by Goyal *et al*[16] in Assam, India.

The review of various databases done by Raman *et al*,[4] determined the highest association of MetS was with hypertension 58% followed by increased waist circumference (42%), high TG levels (40%) and diabetes 34%. Also in the study done by Gupta *et al*,[15] the association of MetS was highest with hypertension (51%) followed by waist circumference (34%), raised TG (33%) and diabetes (17%).

In conclusion, the prevalence of MetS is high in the Nepali population, with a slightly higher prevalence in the postmenopausal women. All the MetS diagnostic markers showed a strong correlation with MetS ($p < 0.001$) in our population. Women with higher BMI were more likely to have MetS. Women with raised blood sugar or preexisting diabetes and raised blood pressure or preexisting hypertension had 14.49 and 14.46 times of having MetS by the IDF criteria.

According to NCEP- ATP III criteria, women with raised blood sugar or preexisting diabetes had 14.82 times of having MetS and women with abdominal circumference of more than or equal to 80 cm had 14.09 times more chances of having MetS.

LIMITATIONS: The study was a single centre with a small population size.

RECOMMENDATIONS: All women above 40 years of age visiting the OPD for consultation should have their lipid profile and blood sugar levels checked.

ACKNOWLEDGEMENTS

The authors would like to thank Pabitra Risal, office staff of the Out Patient Department of the Obstetrics and Gynaecology Department and Dr. Pooja Silwal and Dr. Angina Koirala for their support during the study period and to the participants for their co-operation.

Conflict of interest: None

Source of research fund: None

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