Prevalence and Associated Factors of Metabolic Syndrome among Menopausal Women in a Tertiary Center, Malaysia

[1]Nik Hazlina Nik Hussain M.D., M.Med. (Obstetrics & Gynaecology), [2]Habibah Abdul Hamid MBBS., M.Med. (Obstetrics & Gynaecology), [3]Azidah Abdul Kadir M.D., M.Med. (Family Medicine), [4]Kamarul Imran Musa M.D., M.Med.(Community Medicine), [3]Shaiful Bahari Ismail MBBS., M.Med. (Family Medicine)

[1]Women's Health Development Unit, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, 16150, Kelantan, Malaysia
[2]Department of Obstetrics & Gynaecology, Universiti Putra Malaysia
[3]Department of Family Medicine, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian,16150, Kelantan, Malaysia
[4]Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian,16150, Kelantan, Malaysia

Corresponding author: Associate Prof. Dr. Nik Hazlina Nik Hussain,Head, Women's Health Development Unit, Consultant Obstetrician & Gynaecologist, School of Medical Sciences Universiti Sains Malaysia, 16150, Kubang Kerian, Kelantan, Malaysia, Tel: +609-767 6884/ 6885/6887 H/P: +6012-9282624
Email: hazlina@kb.usm.my

Abstract

Introduction: Metabolic syndrome (MetS) is a condition that includes the presence of a cluster of risk factors specific for cardiovascular disease (CVD). The criteria used to aid the diagnosis of MetS includes abdominal obesity, elevated triglycerides, low high density lipoprotein (HDL) cholesterol, hypertension or use of antihypertensive medication, elevated fasting blood glucose and other risk factors.

Objective: This study aimed to determine the prevalence of metabolic syndrome (MetS) among postmenopausal women and its associated factors in a tertiary center in Malaysia

Methods: This is a cross-sectional study done among 411 postmenopausal women attending Gynaecology clinic and Family Medicine clinic in a tertiary center in Malaysia. Socio demographic data, reproductive profile, menopausal profile and medical history were obtained. Then waist circumference (WC), weight, height and blood pressure (BP) were also recorded. A fasting blood sample was obtained for serum glucose and lipid profile determinations. Metabolic syndrome was defined according to the criteria of International Diabetes Federation.

Results: The mean age of participants was 57.2 $\pm$ 6.9 years. The prevalence of metabolic syndrome was 36.7%. The risk of MetS increased with the presence of obstetrics history of hypertension (HPT) (odds ratio (OR) 2.64, 95% (CI) 1.25-5.62), previous usage of contraception (odds ratio (OR) 1.56, 95% (CI) 1.02-2.42), family history of HPT (odds ratio (OR) 1.71, 95% (CI) 1.13-2.59) and obesity (odds ratio (OR) 2.59, 95% (CI) 1.08-6.23).

Conclusion: There was a high prevalence of the metabolic syndrome in postmenopausal women seeking gynaecologic and primary health care in the tertiary center Malaysia. The associated factors of MetS include previous obstetrics history of HPT, family history of HPT and obesity.

Keywords: Menopause, Metabolic syndrome, Malaysia

Introduction

Metabolic syndrome (MetS) is a condition that includes the presence of a cluster of risk factors specific for cardiovascular disease (CVD). MetS is also known as insulin resistance syndrome or syndrome 'X'. The criteria used to aid the diagnosis of MetS includes abdominal obesity, elevated triglycerides, low high density lipoprotein (HDL) cholesterol, hypertension or use of antihypertensive medication, elevated fasting blood glucose and other risk factors.

Cardiovascular disease is a major cause of mortality in women particularly after the age of 50 years. During the menopausal transition there is an emergence of features related to MetS which in turn increase CVD risk, such as obesity, atherogenic lipid profiles, diabetes mellitus, hyperinsulinism and hypertension [1]. The menopause transition is associated with an increase in total and central obesity. Increased visceral fat is associated with insulin resistance, and this storage of abdominal fat may contribute to CVD and diabetes mellitus in postmenopausal women [2].

The prevalence of MetS among women in United States is 22.6%. The overall prevalence of MetS in Puerto Rico varied according to the definitions used, being higher with the IDF than with the NCEP/ ATP III criteria (33 % versus 24 %) [3]. However this prevalence is 40% in postmenopausal women [4]. Prevalence of MetS among postmenopausal in Middle East is about 41 % [5]. This increasing pattern of prevalence in relation to age was also observed in a study in Norway which showed the prevalence of MetS increase up to the ninth decade among women [6]. This tells us that women face a higher risk of developing Diabetes Mellitus (DM) and Coronary Heart Disease (CHD) when they become older. However, compared to western countries the prevalence of MetS among women in Asian countries is lower. A study done in North Taiwan showed that the prevalence of MetS was 6.2-8.9% and it was found to be higher in postmenopausal women [7]. The prevalence in Vietnam and Hong Kong were about the same, 12% and 18.8% respectively [8, 9]. Although the prevalence of MetS among postmenopausal is lower in Asian countries, it is expected that its prevalence is rising. This is due to the combined effect of rising ageing population and obesity epidemic that will cause a dramatic increase in the prevalence of MetS and related CVD in the next decades.

Postmenopausal women have been shown to have high risk of getting MetS, however there are limited studies done to identify the risk factors for MetS in this group of subjects. The need for assessing populations at risk is urgently required. Thus the purpose for identifying which postmenopausal women with MetS that is more likely to develop CVD, is to develop early screening among this high risk group and aggressive treatment can therefore be initiated early to reduce morbidity and mortality. The aim of this study was to determine the prevalence of MetS and its associated factors among postmenopausal women in Malaysia.

Methods

Subjects

A cross sectional study was conducted from 1st April, 2008 to 31st July, 2009 among 411 postmenopausal women attending Gynaecology clinic and Family Medicine clinic in Hospital Universiti Sains Malaysia (HUSM), Kelantan, Malaysia. Postmenopausal women were defined as having amenorrhoea for at least one year. The inclusion criteria were age ≥ 45 years and having any type of menopause either surgical menopause, natural or iatrogenic chemoradiation therapy.

MetS was diagnosed, in accordance with IDF criteria, when women presented with abdominal obesity (waist circumference≥ 80 cm or BMI ≥ 30kg/m ^{2}) plus two or more of metabolic risk determinants: increased serum triglyceride (TG) (> 1.7 mmol/l), decreased high density lipoprotein (HDL-C) (<1.30mmol/l), high fasting glucose (≥ 5.6 mmol/l) and increased blood pressure (≥130/85 mmHg) [10].

Data Collection

The subjects were identified during their regular Gynaecology clinic and Family Medicine clinic follow-up and were selected using systematic random sampling method. The subjects were approached in the ratio of 1: 2 based upon registration list at the clinic. Systematic random sampling in the ratio of 1:2 which is one of the methods of random sampling was applied. Written informed consent was obtained from the subjects for the participations of the study. Those consented and fulfilled the inclusion criteria were asked to return after an 8-hour overnight fast. Then they were interviewed to fill in the questionnaire on socio-demographic data, reproductive profile, menopausal profile and medical history. Physical examination was done to measure the height, weight, waist circumference and blood pressure. Blood pressure was measured while the participant was sitting quietly for at least 5 minutes, with the feet flat on the floor (legs uncrossed). Waist circumference was measured to determine central obesity. In addition, a 10–15 ml peripheral venous blood sample was obtained for serum glucose and lipid profile analysis.

Women taking oral hypoglycemic agents, lipid lowering agents or antihypertensive medications prescribed by a physician were considered as diabetic, having hyperlipidemia (HPL) or hypertensive independent of the serum or blood pressure finding.

Statistical analysis

Sample size was calculated using Power and Sample Size calculation software [11] based on the two sample t-test calculation formula. The ratio between Metabolic Syndrome and non-Metabolic Syndrome based on study done by Royer et al. [12] on variable HRT with dichotomous test α =0.05, power=0 .80, p1-0.59, p2=0.55, m=2. The minimum required sample size was 340 and after considering the non-response rate of 10%, the sample size calculated was 374.

All data was entered and analyzed using Statistical Program for Social Sciences (SPSS) version 12.0 (SPSS Inc.2003). All continuous variables were expressed as mean with standard deviation or median with inter-quartile range. Frequencies and percentages were obtained for categorical variables. Simple Logistic regression analysis was chosen as the dependent variable has the binary outcome. The independent variables are a mix of continuous and categorical variables. The dependent variable was metabolic syndrome and non metabolic syndrome. Logistic regression was chosen as the dependent variable has the binary outcome. Simple logistic regression was performed on all the independent variables and the outcome was tabulated. It was used as a screening in selection of variables for further step of analysis.

Approval by the research and ethics committee

The protocol was approved by the Research and Ethical Committee, School of Medical Sciences, Universiti Sains Malaysia [Ref: USMKK/PPP/JEPeM 201.4. (1.7)].

Results

A total of 411 subjects were recruited. The mean age of the subjects was 57.2 ± 6.9 years old. The age ranged from 45 years old to the eldest 84 years old**.** Out of 411 women, 36.7% (n=151) were diagnosed to have MetS.

Table 1 shows socio-demographic, reproductive, menopausal and medical profile of the subjects. The mean age of menopause among the participants was 49.8 $\pm$ 4.23 years. The mean age at menarche was 13.4 $\pm$ 1.7 years. The age of menarche range from10 years to 17 years. There were 39.4% (n=162) of Hormonal Replacement Therapy (HRT) users and 60.6% (n=249) of non-users. The mean duration of HRT usage was 4.6 $\pm$ 3.25 years. The most common medical disorder among participants who were involved in this study was HPT which contributed 49.1% (n=202). It was followed by DM (14.6%), HPL (9.8%) and CVD (4.9%).

Table 2 shows the prevalence of each component in MetS. All of the subjects had central obesity since abdominal obesity is the main criteria according to IDF criteria. Hypertension has the highest prevalence among the metabolic component.

The result of simple logistic regression analysis to determine the associated factors of metabolic syndrome among the menopause subjects are shown in table 3.
Simple logistic regression showing that variables statistically significant influence the risk of developing MetS were previous obstetrics history of HPT, contraception used during reproductive period with OR= 2.64, 95% CI: 1.25- 5.62, p= 0.011 and OR= 1.56, 95%CI: 1.02- 2.42, P= 0.041, family history of HPT and obesity with OR= 1.17, 95% CI: 1.13- 2.59, p = 0.011 and OR= 2.59, 95%CI: 1.08- 6.23, p = 0.033 respectively.

Discussion

Studies have shown that the prevalence of MetS is higher in postmenopausal women compared to premenopausal women [7, 13]. During the menopausal transition there is an emergence of features related to the MetS which in turn increase CVD risk, such as obesity, atherogenic lipid profiles, diabetes mellitus, hyperinsulinism and hypertension [1]. The transition from pre to postmenopause is associated with the emergence of many features of the MetS, including i) increased central (intraabdominal) body fat; ii). a shift toward a more atherogenic lipid profile, with increased low density lipoprotein and triglycerides levels, reduced high density lipoprotein, and small, dense low density lipoprotein particles; iii) and increased glucose and insulin levels. The emergence of these risk factors may be a direct result of ovarian failure or, alternatively, an indirect result of the metabolic consequences of central fat redistribution with estrogen deficiency. It is unclear whether the transition to menopause increases CVD risk in all women or only in those who develop features of the MetS.

Prevalence of MetS among menopausal women varies greatly in different populations. It ranges from 12% in Vietnam to 49% in Brazil [13, 14]. These differences are probably related to ethnic variations, different criteria used for definition, study design and sample size. Among Asian studies it showed that Asian Indians have a high prevalence of MetS that is 55% according to IDF criteria. The study in China using the same criteria is 37% [15] and it is comparable with this study that is 36.7%. However, studies among Chinese populations in North Taiwan, Vietnam and Hong Kong showed that the prevalence of MetS among postmenopausal women were lower that were 9.4%, 12% and 18.8% respectively [7, 9, 14]. These could be due to genetic characteristic which is responsible for lower prevalence of abdominal adiposity.

In comparison with studies done in Latin American cities, it showed that almost one-third of the Latin American postmenopausal population was classified as having MetS [12]. The overall prevalence of MetS in Puerto Rico varied according to the definitions used, being higher with the IDF than with the NCEP/ ATP III criteria (33 % vs 24 %) [3]. Other than that, MetS among postmenopausal in Ecuador [16]. Middle East [5] approached to 40 %. Rosenbaum et al. [3] reported a higher prevalence (45 -58%) of MetS among the Japanese-Brazilian population.

In this study, all of the women diagnosed as MetS had abdominal obesity as this is the main and compulsory component in IDF criteria. It was followed by other risk factors such as hypertension, low HDL cholesterol, hypertriglyceridemia and diabetes which were present at 78.8 %, 67.5%, 58.3% and 53.0% respectively. Oh et al. studied among South Korean women and found that the most frequent components were: low HDL, systemic hypertension, hypertriglyceridemia, hyperglycemia and abdominal obesity [17]. However, a study in Brazil among postmenopausal women showed that the most frequent component were Low HDL, hypertension and abdominal obesity [13]. These differences in characteristic seen are due to genetic, ethnicity and different criteria used for definition.

There was a direct correlation established between the age of the participants and MetS. The prevalence of MetS increases with age, from 6.7% in the third decade to 43.5% in the 7th decade [5]. In a study done [18] also showed that MetS rate increase with age (OR= 1.3; 95% CI: 0.8-2.0) but the result was not significant and it was no different compared to the result in a study done [16]. A study done by Lin W et al. [7] showed a significant result statistically with OR=1.10: 95% CI: 1.03–1.18.

This study had several limitations. First, only those women that attend the Gynaecology clinic and Family Medicine clinic at the hospital were studied thus the results of this study may not reflect the overall postmenopausal women of the general population in Malaysia. Also, in our study, MetS diagnosis was based on IDF criteria which required the waist circumference as a compulsory feature, which would exclude those patients with diabetes and hypertension who had normal waist circumference.

In our study, MetS diagnosis was based on IDF criteria which required the waist circumference as a compulsory feature, which would exclude those Polycystic Ovarian Syndrome (PCOS) patients with diabetes and hypertension who had normal waist circumference.

This study was done only at two main tertiary centres in north east of Peninsular Malaysia. This may not represent the whole PCOS patients in Malaysia.

Conclusions

The overall prevalence of metabolic syndrome among postmenopausal Kelantanese women attending Gynaecology Clinic and Family Medicine Clinic, HUSM in this study was 36.7%. The prevalence of women with hypertensive, diabetes mellitus (DM), dyslipidemia with hypertrigliceridemia, dyslipidemia with low HDL and abdominal obesity were 78.8%, 53%, 58.3%, 67.5% and 100%, respectively. Obstetrics history of HPT, previous contraception usage as well as family history of HPT and obesity has significant association with risk developing MetS.

The study also showed that age of the women and duration of menopause was not significant associated with MetS. The use of hormonal replacement therapy did not have any impact on reducing or increasing risk of developing MetS. The sociodemography and reproductive profile was no obvious contribution significantly in relation to MetS.

This study highlighted the prevalence of MetS among postmenopausal women is high and comparable with others country worldwide. Thus Malaysian postmenopausal women have a high risk for CVD mortality and morbidity. This subset of women may require targeted management to prevent future cardiovascular risk.

This is an interesting and important subject, worthy of, but with a much larger number of subjects and involving variety of ethnic group with comparable number. Patients at risk should receive education and counseling on lifestyle modification, and all risk factors for heart disease should be treated aggressively. The authors obviously need to restructure some fundamentals in their society to have a better understanding of these metabolic changes with menopause in recognition of women at risk for future CVD. This will lead to appropriate interventions to live in healthier and better quality life style.

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Table 1: The socio demographic, reproductive, menopausal and medical profile of the subjects

Characteristic	**MetS** N (%)	**No MetS** N (%)
Age		
45 – 54	66 (36.5%)	115 (63.5%)
55 - 64	71 (39.2%)	110 (60.8%)
65 - 74	12 (29.3%)	29 (70.7%)
75 – 84	2 (25%)	6 (75%)
Race	127 (37.7%)	
Malay	24 (27.9%)	210 (63.3%)
Non Malay		50 (72.1%)
Educational status		
No formal education	19 (40.4%)	28 (59.6%)
Primary	38 (36.5%)	66 (63.5%)
Secondary	62 (36.5%)	108 (63.5%)
Tertiary	32 (35.6%)	58 (64.4%0
Marital status		
Unmarried	3 (33.3)	6 (66.7)
Married	122(37.9)	200(62.1)
Widow	26 (32.5)	54 (67.5)
Monthly income		
< RM 500	19 (28.4)	48 (71.6)
RM 501-1000	47 (43.1)	62 (56.9)
RM 1001-1500	19 (41.3)	27 (58.7)
>RM 1500	66 (34.9)	123 (65.1)
Smoking	4 (33.3)	8 (66.7)
Parity		
0-5	107 (38.4)	172 (61.6)
6-10	43 (33.9)	84 (66.1)
11-15	1 (20)	4 (80)
Past obstetrics of DM	6 (28.6)	15 (71.4)
Past obstetrics of HPT	19 (52.8)	17 (472)
Previous usage of contraception	54 (44.3)	68 (55.7)
Menopausal profile		
Menopausal age	49.8 (4.23) [a]	

Natural	15 (36.9)	25 (63.1)
Surgical	98 (35.8)	184 (64.2)
others	38 (70.0)	51 (30)
Duration of menopause 7.6 (7.2) [a]		
1-10	123 (38.1)	200 (61.9)
11-20	21 (30)	49 (70)
21-30	7 (50)	7 (50)
>30	0	4 (100)
HRT user	58 (35.8)	104 (64.2)
HPT	107 (53)	95 (47)
DM	45 (75)	15 (25)
HPL	29 (72.5)	11 (27.5)
CVD	7 (35)	13(65)
Obesity	13 (54.2)	11 (45.8)
Family history of HPT	78 (43.8)	100 (56.2)
Family history of DM	53 (43.8)	68 (56.2)
Family history of HPL	14 (42.4)	19 (57.6)
Family history of obesity	13 (59.1)	10 (40.9)
Family history of CVD	34 (43)	45 (57)

[a] Values are expressed as mean (standard deviation, SD)

Table 2: Prevalence of metabolic profile according to diagnostic components among post menopausal women with MetS

Metabolic factor	**Frequency**	
	n	**%**
Abdominal Obesity (WC ≥ 80cm or BMI ≥ 30kg/m^2)	151	100
HPT or high **BP** (BP ≥ 130 / 85mmhg)	119	78.8
HPL or low **HDL** (HDL < 1.3 mmol/L)	102	67.5
HPL or high **TG** (TG ≥ 1.7 mmol/L)	88	58.3
DM or high **FBS** (FBS ≥ 5.6 mmol/L)	80	53.0

Table 3: Simple logistic regression analysis to determine the associated factors of metabolic syndrome among the menopause subjects

Risk factor	Crude OR	95% CI	df	p- value
Age				
45-54	1	-	3	0.588
55-64	1.3	0.74-1.72	1	0.588
65-74	0.94	0.35-1.51	1	0.385
75-84	0.59	0.59-2.96	1	0.513
Education				
Never	1		3	0.720
Primary	0.76	0.27-2.12	1	0.600
Secondary	0.61	0.21-1.69	1	0.337
Tertiary	0.55	0.18-1.73	1	0.309
Income				
<RM 500	1		1	0.275
RM 501-1000	1.79	0.93-3.47	1	0.084
RM1001-1500	1.66	0.73-3.78	1	0.225
>RM1500	1.25	0.59-2.62	1	0.559
Smoking				
No	1		1	0.438
Yes	1.33	0.82-21.44		0.842
Parity				
0-5	1		2	0.542
6-10	0.84	0.54-1.3	1	0.443
11-15	0.39	0.04-3.5	1	0.399
Obstetrics history of DM				
No	1			
Yes	0.49	0.17-1.40	1	0.183
Obstetrics history of HPT				
No	1			
Yes	2.64	1.25-5.62	1	**0.011***
Previous usage of contraception				
No	1			
Yes	1.56	1.02-2.42	1	**0.041***
Age of menarche	0.89	0.79-1.01	1	0.080

Type of Menopause				
Natural	1		1	0.421
Surgical	0.87	0.40-1.90	1	0.722
Others	1.27	0.54-3.09	1	0.595
Menopause duration				
1-10	1		1	0.331
11-20	1.27	0.65-2.46	1	0.481
21-30	2.23	0.71-7.15	1	0.171
> 30	-	-	1	0.999
Menopause age	0.99	0.95- 1.04	1	0.834
HRT usage				
No	1			
Yes	0.89	0.59-1.34	1	0.563
Obesity				
No	1			
Yes	1.41	0.55-3.58	1	0.471
Family history of HPT				
No	1	-		
Yes	1.17	(1.13-2.59)	1	**0.011***
Family history of DM				
No	1	-		
Yes	1.52	(0.98-2.35)	1	0.063
Family history of HPL				
No	1			
Yes	1.28	(0.62-2.64)	1	0.500
Family history of CVD				
No	1	-		
Yes	1.38	(0.83-2.27)	1	0.214
Family history of obesity				
No	1	-		
Yes	2.59	(1.08-6.23)	1	**0.033 ***