ORIGINAL ARTICLE

Prevalence and risk factors of Metabolic Syndrome (MetS) in Primary Health Care Centers' Attendants in Majmaah, Saudi Arabia

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Abstract

Background: Metabolic syndrome (MetS) is a cluster of established cardiovascular risk factors that collectively increase predisposition to major chronic diseases, including heart diseases and diabetes mellitus. Population of Saudi Arabia is at risk for MetS as a result of industrialization and change in life style. The objectives of the current study were to determine the prevalence of metabolic syndrome in Majmaah area, to estimate its risk factors and to determine the relation between metabolic syndrome and the social factors.

Methodology: The study was a cross-sectional and facility-based conducted in Majmaah city in Saudi Arabia. The sample size was calculated as 353. The data was collected by a pre-tested questionnaire. Weight, height and abdominal circumference were measured. Fasting blood samples were collected to ascertain fasting blood glucose and lipid profile. Components of full MetS as defined by the NCEP-ATP- III criteria were used for screening.

Results: The prevalence of MetS among adults attending Primary Health Care Centers in Majmaah was 44.5%. MetS was significantly higher in males than in females (61.2 vs. 38.8%; P =0.001). Prevalence of MetS showed an increase trend with age from 20 years to 59 years, and inversely with educational status (illiterates 27% and university graduates 14.6%). MetS was associated with occupation; the housewives showed the highest prevalence of the syndrome followed by the government employees (36.3% and 34.3% respectively).

Conclusions: Majmaah adult population has high prevalence of metabolic syndrome. Metabolic Syndrome is more prevalent among males, the low educated, the old age groups, the low income as well as among the employees and the housewives..

Keywords: Metabolic Syndrome, Prevalence

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الملخص

خلفية: متلازمة الأيض هي مجموعة من عوامل الخطر القلبية الوعائية والتي تؤدي في مجملها للإصابة بالأمراض المزمنة الرئيسية، بما في ذلك أمراض القلب وداء السكري. لدى السكان بالمملكة العربية السعودية زيادة في معدل الاصابة بمتلازمة الأيض نتيجة للعولمة وتغيير نمط الحياة. الهدف من الدراسة الحالية هو تحديد مدى انتشار متلازمة الأيض في منطقة المجمعة وتحديد عوامل الخطر بالاضافة الى تحديد العلاقة بين متلازمة الأيض والعوامل الاجتماعية. منهجية الدراسة: هذه دراسة مقطعية أجريت في مدينة المجمعة بالمملكة العربية السعودية. تم حساب حجم العينة لتبلغ ثلاثمائة وثلاثة وخمسين. تم جمع البيانات عن طريق الاستبيان وتم قياس الوزن والطول ومحيط البطن. تم جمع عينات الدم لقياس سكر عند الصيام وتحديد نسبة الدهون. ولتعريف مصطلح الأيض استخدمت مكونات متلازمة الأيض الكاملة على النحو الذي تحدده معايير البرنامج التعليمي الوطني للدهون- مجموعة علاج الكبار رقم٣.

النتائج: معدل انتشار متلازمة الأيض بين البالغين الذين يترددون على مراكز الرعاية الصحية الأولية في المجمعة هو ٤٤,٥٪. أظهرت الدراسة أن معدل انتشار المتلازمة اعلى بين الذكور مقارنة بالاناث(٦١,٢٪ مقابل ٣٨,٨٪) . يزداد معدل انتشار المتلازمة مع التقدم في العمر من ٢٠ إلى ٥٩ عاما، وعكسيا مع المستوى التعليمى (الأميين ٢٧٪ وخريجي الجامعات ١٤,٦٪). ارتبطت متلازمة الأيض بنوع الوظيفة اذ أظهرت الدراسة أن لدى ربات البيوت أعلى نسبة انتشار للمتلازمة يليهن موظفي الحكومة (٣٦,٣٪ و ٣٤,٣٪) على التوالي. الخلاصة: خلصت الدراسة الى أن هنالك ارتفاع في معدل انتشار متلازمة الأيض بين سكان المجمعة البالغين. متلازمة الأيض هى أكثر انتشارا بين الذكور، وذوي المستوى التعليمي الأدنى، والأكبر سنا، وذوي الدخل المنخفض بالاضافة الى الموظفين وربات البيوت.

Introduction:

Metabolic syndrome is a combination of the medical disorders that a high blood sugar level, excess body fat around the waist ,increased blood pressure and abnormal cholesterol levels — that occur together, increasing risk of diabetes, stroke and heart disease. Having just one of these conditions doesn't mean you have metabolic syndrome. However, any of these conditions increase risk of serious disease. If more than one of these conditions occurs in combination, risk is even greater [1]. The US National Cholesterol Education Program Adult Treatment Panel III (2001) requires at least three of the following: Fasting plasma glucose ≥ 6.1 mmol/L (110 mg/dl), Blood pressure ≥ 130/85 mmHg (or treated for hypertension), central obesity: waist circumference ≥ 102 cm or 40 inches (male), ≥ 88 cm or 35 inches (female). Dyslipidemia: TG ≥ 1.7 mmol/L (150 mg/dl). Dyslipidemia: HDL-C < 40 mg/dL (male), < 50 mg/dL (female) [2].

Different studies on prevalence of metabolic syndrome showed different results; In the United States, an age-adjusted prevalence of 23.9% was found using the data from a nationally representative sample of American citizens derived from a cross-sectional health survey [2]. The prevalence was found as 20.7% among Irish middle-aged men and women [3]. In a study conducted among Arab Americans, the prevalence was found as 23% [4]. In a large multi-ethnic cohort study of the US population, the overall prevalence of the syndrome was found as 24% in the

general population, with an inter-ethnic variation of 21-31% [5]. In a study conducted in Oman to determine the prevalence of the Metabolic Syndrome among Omani adults the prevalence was found as 21% [6]. Using the WHO definition of metabolic syndrome, a prevalence of 17% among the Palestinians in the West Bank was found [7].

In Saudi Arabia, the prevalence of metabolic syndrome among Qassim University personnel was 31.4% [1] and of 20.8% among military personnel in the kingdom [8], 39.3% and age-adjusted prevalence of 39.3% [9]. In a recent study conducted at national level the prevalence of MetS was 28.3% [10].

Metabolic syndrome increased with age but increases even more dramatically as BMI increases. The prevalence of metabolic syndrome varied by race and ethnicity but the pattern was different for males and females [11]. In a study conducted among Qassim University Personnel in Saudi Arabia the prevalence showed a steady increase with increasing age, BMI and serum cholesterol. General obesity measured by BMI was the most common component of the syndrome where 75% of participants suffered from overweight and obesity. Dyslipidemia was also very common. Participants with high-density lipoprotein below protective level constituted 73.6%, while those with total cholesterol and triglyceride above clinically normal level constituted 60.0% and 46.4% respectively. Fasting plasma glucose and hypertension was the least common. Older individuals and those with higher BMIs were found to have a higher concentration of the factors. This observation was evident across all groups of participants whether having one or more factors [1].

The objectives of the current study were to determine the prevalence of metabolic syndrome in Majmaah area, to estimate its risk factors and to determine the relation between metabolic syndrome and the social factors.

Materials and methods:

The current study was an observational, cross–sectional and facility-based study to determine the prevalence of metabolic syndrome in Majmaah area. The duration of the study was one year from September 2013 and October 2014. The study was conducted in Majmaah city, which is located in Majmaah province, Riyadh area in Saudi Arabia. The city has a population of about 45,000. The study population was Saudi adults 20-70 years of age attending selected primary health care centers in Majmaah for any reason. Non Saudi residents and pregnant women were excluded from this study. The sample frame was the primary health care centers and the patients visiting these centers in Majmaah city. The health centers which selected by simple random sampling were Alfiha, Almajmaah, Hai Almataar, Al Yarmook and Alfaisilia. The sample size was calculate as 336 taken as 353 [11]. Systemic sampling was used for selection of respondents within the selected health centers.

The data were collected through a pre-tested questionnaire. The questionnaire included socio demographic factors (age, gender, occupation, residence, income and marital status), clinical examination and laboratory investigations. The clinical examination included Body Mass Index (BMI), assessment of arterial blood pressure and measuring waist circumference. Weight was measured by a weighing machine (DETECTO, made in USA). The weighing machine was placed over a straight floor and is set at Zero and checked after each patient to guarantee that it is in its place. The participants were weighed while dressed in light clothes. The same machine was used all over the study and for all participants. The reading was taken by a kilogram to one decimal. The height was measured by a full length stadiometer. The participants stood straight and looking forward while their heels were against the stadiometer pole. Participants' height was measured without shoes and head covers. The upper pole of the machine was placed over the head without pressure and measurements were taken by centimeter to the nearest one decimal. The BMI was calculated according to the following formula: BMI=weight (kg)/height $(m)^2$. The waist circumference was measured by using a measuring tape while the participant is standing erect and had relaxed the abdominal muscles. Measuring point was between the iliac crest and the lower rib. The position of the tape measure was positioned horizontally, parallel to the floor. The measurements were recorded by the centimeter to one decimal. The blood pressure was measured by using sphygmomanometer. A properly sized blood pressure cuff was used. The cuff was raped around the upper arm with the cuff's lower edge one inch above the antecubital fossa. The measurement was taken when the participant was sitting down. The stethoscope's bell was lightly pressed over the brachial artery just below the cuff's edge. The cuff was rapidly inflated to 180 mmHg. Release air from the cuff at a moderate rate (3mm/sec). The first knocking sound (Korotkoff) was the subject's systolic pressure. When the knocking sound disappears the measurement is recorded as a diastolic pressure.

The laboratory investigations were measured by a laboratory specialist by using the same machine for all the samples. Tests included total cholesterol, HDL cholesterol, LDL, triglycerides, and fasting glucose. Total cholesterol, HDL cholesterol, and triglycerides were enzymatically measured. Cholesterol was calculated using Friedwald's formula [LDL cholesterol = total cholesterol − (HDL cholesterol + triglyceride/5)] for triglyceride levels <400 mg/dl. Diabetes was defined as fasting glucose ≥126 mg/dl or glycemic levels 2 h after a 75-g oral glucose load ≥200 mg/dl [12].

The data was analyzed by using SPSS (version 22) software. The data was validated by the mechanism of double entry that SPSS software offers. The two files were double entered, and the original file was matched by the statistician to reduce the errors.

The study was approved by the Ethics Committee of the Basic and Health Science Research Center, Majmaah University. A written consent was obtained from all respondents.

Results:

Table (1) shows the distribution of MetS according to subjects' socio demographic characteristics. MetS was significantly higher in males than females (61.1% versus 38.9%). MetS prevalence was higher among older age group up to 59 years of age. Prevalence of MetS among the age groups 20-29, 30-39, 40-49 and 50-59 constituted 5.7%, 13.4%, 30.6% and 33.1% respectively. Regarding the relation of Mets with the educational level, results showed that MetS among the illiterates was 27.4%. MetS among the primary, intermediate, secondary and university educated was 17.8%, 21.7%, 18.5% and 14.6% respectively.

The government employees and the house-wives had the higher prevalence of MetS (42% and 36.3%). Regarding the relation between MetS and the participants' monthly income it was shown that the prevalence of the disease among those with low income was 52.2%. Mets among those with moderate, high and very high income constituted 26.8%, 18.5% and 2.5% respectively.

Table 1. Distribution of MetS among participants according to Demographic characteristics (n =353)

Characteristics	Population	MetS	X^2	p
Gender				
Male	(44.5%) 157	(61.1%)96		
Female	(61.2%) 196	(38.9%)61	24.522[a]	0.001
(Age group(years				
20-29	(15.6%)55	(5.7%)9		
30-39	(15.3%)54	(13.4%)21		
40-49	(28.9%)102	(30.6%)48		
50-59	(28.3%)100	(33.1%)52	27.599	0.001
60-69	(6.8%)24	(9.6%)15		
70	(5.1%)18	(7.1%)12		
Education				
Illiterate	(26.3%)93	(27.4%)43		
Primary	(18.1%)64	(17.8%)28		
Intermediate	(15.0%)53	(21.7%)34		
Secondary	(15.9%)56	(18.5%)29		0.001
University and Above	(24.6%)87	(14.6%)23	21.114	
Occupation				
Government Employee	(34.3%)121	(42.0%)66		
Private employee	(3.4%)12	(1.9%)3		
Business	(2.8%)10	(4.5%)7		
Military	(2.0%)7	(1.9%)3		
House wives	(41.9%)148	(36.3%)57	27.246	0.001
Student	(8.2%)29	(2.5%)4		
Others	(7.4%)26	(10.8%)17		
Monthly income/SR				
(Low (< 5000	(46.7%)165	(52.2%)82		
Moderate ((5000 - 10,000	(28.3%)100	(26.8%)42		0.001
High (10,001 - (15,000	(22.7%)80	(18.5%)29	4.361	
V. high (> (15,000	(2.3%)8	(2.5%)4		

Table 2. Univariate regression analysis of selected habits As risk factors for MetS

Habit	Total	Met S	X^2	P
Performing regular exercise				
Yes	(25.5%)90	(24.8%)39	X^2	P
No	(74.5%)263	(75.2%)118	0.064	0.449
Ever smoking				
Yes	(9.9%)35	(10.8%)17	X^2	P
No	(90.1%)318	(89.2%)140	0.264	0.607
Fat diet consumption				
High	(35.4%)125	(44.8%)64	X^2	P
Low	(29.2%)103	(31.5%)45		
Carbohydrates diet consumption				
High	(14.2%)50	(15.4%)22	6.773	0.079
Low	(21.2%)25	(8.4%)12		

Table (2) shows the univariate regression analysis between certain habits and the risk of MetS. The prevalence of MetS among those who perform physical exercise was 24.8% compared to 75.2% among those who didn't perform physical exercise. The prevalence of MetS among subjects who never smoked was 89.2% compared to 10.8% among those who ever smoked. Results showed that 44.8% of the subjects who consumed high fatty food had MetS while 31.5% of those who consume low fatty food contracted the disease. Regarding consumption of carbohydrate diet, 15.4% and 8.4% of those who consume high and low carbohydrate diet had MetS but the relation was not significant.

Discussion:

The prevalence of (MetS) in Majmaah adults in Saudi Arabia, utilizing ATP III criteria, was 44.5%. This finding is comparable to other national and regional studies [13- 22]. MetS affects approximately one-quarter of adults in many developed countries [23, 24]. It represents a group of risk factors that are linked to the accelerated development of atherosclerosis and CVD. Though the exact pathogenesis is not known, many risk factors have been identified [25]. The significant risk factors identified by our study included male gender, increasing age, low education, low income, government employee and housewives (p= 0.001). The prevalence of MetS was higher with male gender compared to females. The syndrome was also associated with increase age until 59 years; these findings were consistent with other studies [14, 26, 27, 28].

The low educated were at increased risk of MetS according to this study. Many studies reported a higher prevalence of MetS among the less educated subjects. Our findings are in agreement with the findings of these studies [34, 35, 36, 37]. We found that subjects with low income had higher prevalence of MetS. Studies in other countries showed no

association of income with MetS [36, 38, 39, 40]. Those with low income may have limited choices regarding their diet. Low education may also play a role in this. Occupation was significantly associated with MetS in this study in which prevalence rates among housewives and government employees were higher. Other studies reported significant association of MetS with the occupation, but there was no consistency with the nature of the occupations, in an Indian industrial setup to study disparity in occurrence of MetS in a working population based on occupational status found that 19% of the non-manual workers and 18.3% of the manual workers suffered from MetS, and the single largest occupational category with MetS included the managers and senior officials [41]. MetS prevalence is considered to be high among Jordanian employees [42].

In this study those who don't perform regular physical exercise had more prevalence of MetS but the relation was not significant (0.449). Poor lifestyle practices, including lack or absence regular physical exercise is significantly associated with MetS in this study, which was in accordance with many studies [29-33]. Physical inactivity is strongly and inversely associated with MetS, which reduces with weight loss and regular physical activity [33, 34].

In our study the nonsmoker has high prevalence of Mets and the relation is not significant. This is consistent with other studies; MetS has been significantly associated with smoking in some studies. Smoking was associated with MetS despite the fact that smokers may have lower BMI than nonsmokers [34]. The high prevalence of Mets in this study can be explained by the fact that most of our subjects were females who disclose their smoking status in a semi urban community where smoking female is considered unacceptable. In this study respondents who consume high fat and carbohydrate diet had high prevalence of MetS bust results didn't show statistical significance. This may be explained through high prevalence of obesity and diabetes among those who consume high fat and carbohydrate diet.

Conclusion:

Majmaah adult population has high prevalence of metabolic syndrome, almost the same prevalence of metabolic syndrome like what was found in other areas of Saudi Arabia. Metabolic Syndrome is more prevalent among males, the low educated, the old age groups, the low income as well as among employees and housewives. Despite accumulating evidence of an epidemic, major policies are advised to be adopted and campaigns launched to control and prevent MetS among Saudi population.

Authors' contribution:

All of the authors contributed equally in this work.

Conflicts of interest:

The authors have no conflict of interest to declare.

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