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Prevalence and Some Determinants of Metabolic Syndrome among Primary Care Clinic Attendees at King Fahd Military Medical Complex

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Abstract: ***Aim: Purpose of the study was to clarify the prevalence and investigate risk factors of metabolic syndrome among primary health care clinic attendees at KFMMC, Dammam, KSA. Method: This cross-sectional study was conducted at the King Fahd Military Medical Complex, Dhahran (KFMMC). IDF criteria were applied to evaluate metabolic syndrome. In inclusion criteria, at least 20 years old Saudi national was eligible to participate in the study. Results: A total of 291 patients were included in the study. Male to female ratio is 1:1.4. The overall prevalence of metabolic syndrome was 48.5%. The prevalence of females (52.26) was greater, although not significant than that in males (44.12%). Nearly three quarters (72.25%) of the studied females had risk factors compared to two thirds (66.19%) of the studied males. Conclusion: Because of the high prevalence of metabolic syndrome among the people living in the eastern region of Saudi Arabia, it is necessary to educate them and be aware of this health-related problem. Increased awareness and knowledge would help reduce the prevalence of this issue and keep it under control.***

Keywords: Metabolic Syndrome, CV risk

1. Introduction

Metabolic syndrome (MetS), also known as a dysmetabolic syndrome, is a cluster of risk factors that come together in a single individual (1). In the 1990s, experts attempt to develop a unified definition of metabolic syndrome, and they agreed upon two most commonly used definition which includes 1999 World Health Organization (WHO) criteria and 2001 National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) (2, 3).

According to WHO criteria, diagnosis of MetS comprised impaired glucose tolerance (IGT), measured by a hyperinsulinaemic euglycaemic clamp. Insulinaemia is measured, or TIIDM os present, and at least 2 of the following risk factor: (1) obesity; waist-to-hip ratio and/or BMI > 30kg/m^2. (2) dyslipidaemia; elevated plasma TG or decreased HDL-C levels (different levels for men and women); or (3) hypertension and microalbuminuria (4)

In 1999, the European group for the study of insulin resistance (EGIR) suggested the terminology of insulin resistance syndrome (IRS) and excluded TIIDM. This IRS based MetS already included the 5 markers (waist, fasting hyperglycaemia, hypertension, TG, HDL-C), central obesity was used the first time, and that would later become IDF/JIS MetS. Although to most clinicians, the IDF/JIS MetS appear to be NCEP MetS-derived. Furthermore, medication development for cardiovascular disease (CVD) risk markers tends to normalize BP, LDL-C, and hyperglycemia and modestly reduce post-event mortality.

In central obesity, lipids cannot accommodate and oxidise in a timely manner due to excessive production of macronutrients, and energy is always in oversupply. B-cells have increased tonic insulin production to increase glucose transport into the cells as glycogen storage molecules in the liver. In MetS the normal, rapid first phase after a meal or post-prandial rise of insulin in healthy slim people, is lost.

The interrelated risk factors include obesity, insulin resistance, dyslipidemia, abnormal cholesterol, increased risk of clotting, and hypertension, leading to type 2 diabetes mellitus and cardiovascular disease (CVD) (4-7). In the third national health and nutrition examination survey in America, data of over 8800 men and women were analyzed, and the prevalence of metabolic syndrome was found 24% (8). Although there is not much literature on the prevalence of metabolic syndrome in the Arab region, available studies reported its growing severity among the Arab population. Studies reported that in Oman, 21% (n=1419) adults were suffering from this problem. In the Palestinian west bank community, an urban and rural comparison was made in which 500 individuals from rural and 492 from urban were taken, the prevalence of metabolic syndrome was 25.4 and 21.5 among the rural and urban population was found. 23% of Arab Americans among 542 individuals were having metabolic syndrome and 16.3% in Sahraoui women out of 249. (9-12)

Some studies reported the prevalence from Saudi Arabia, a study from Jeddah stated the 21% prevalence of syndrome among healthy Saudi adults when they screened 600 healthy individuals (13). Another study from Qassim in which over 550 participants were enrolled, found 31.4% prevalence among Qassim University's personnel (14). They also used logistic regression to analyze the relationship between metabolic syndrome and risk factors (13, 14)

To the authors best knowledge, hardly any information available from Eastern regions of Saudi Arabia related to metabolic syndrome, which provided the rationale for the current study. The purpose of the study was to clarify the prevalence and investigate risk factors of metabolic

syndrome among primary health care clinic attendees at KFMMC, Dammam, and KSA.

2. Methods

Study design

A cross-sectional hospital-based survey was conducted among attendees of primary health care clinics.

Study setting/time

The study was conducted at the King Fahd Military Medical Complex, Dhahran (KFMMC), Eastern Region, Kingdom of Saudi Arabia (KSA). King Fahd Military Medical Complex is one of the Ministry of Defense Hospitals and chosen for the study for the following reasons: ease of obtaining approval from the relevant authorities and ease of data collection. King Fahd Military Medical Complex includes 14 primary health care clinics. All of these clinics were included in the study. The study had been completed since December 2017. The study was approved by local health authorities (King Fahd Military Medical Complex Research Ethical Committee and Family Medicine Board committee, Eastern region. All participants were informed about the purpose of the study and provided oral consent. Participants were informed that their information would be kept confidential and there would be no personal data to be shared.

Inclusion criteria

Participants were included if they attended the primary health care clinics at KFMMC, were 20 years and older, and were Saudis.

Study sample

All patients attending the primary health care clinics for any purpose during data collection (September-November/2017), and met the inclusion criteria were asked to be included in the study, and the response rate was calculated. The sample was stratified by age groups of 20-29, 30-39, 40-49, 50-59, 60-69, and over 70 years old.

Sampling technique

For randomization, not every eligible individual was asked to participate in the study. Rather, every 10th individual was included if he/she had agreed to do so. This was done to eliminate any source of selection bias as well as to insure against the accidental bias. Also, participants were allowed to withdraw from the study at any time without any harm or cost, which has resulted in a fewer number than expected.

Criteria for diagnosing MetS

The 2005 IDF criteria [11]were applied. The 2005 IDF criteria define MetS as having central obesity (defined as waist circumference ≥ 94 cm for European men and ≥ 80 cm for European women, with ethnicity-specific values for other groups)* Plus any two of the following four factors:

1) Triglycerides ≥ 1.7 mmol/l, or on treatment
2) HDL cholesterol < 1.03 mmol/l in men and < 1.29 mmol/l in women, or on treatment
3) Blood pressure ≥ 130/85 mmHg, or on treatment

Fasting plasma glucose ≥ 5.6 mmol/l, or previous diagnosis of diabetes

Data collection

A self-developed questionnaire consisting of both open-ended and close-ended items was used in the study. The questionnaire included questions on Socio-demographic factors, Risk factors, and diagnostic criteria. The questionnaire was prepared and developed through (April/2017). Personal data was collected through an interview questionnaire by the researcher from all participants. Due to some administrative work, large number of cases presented in the clinic, and the researcher external commitments, all data were collected in a week. In order to collect the clinical data, all patients had submitted following:

- A venous blood sample was taken to determine plasma glucose, triglycerides, total and HDL cholesterol concentrations.
- Blood pressure was measured with a standard mercury sphygmomanometer on the left arm after at least five minutes of rest.
- Waist circumference was measured midway between the iliac crest and the lower costal margin.
- Bodyweight and height were recorded in light clothes and no shoes. BMI ≥30.0 kg/m2 will be classified as obese, and BMI 25–29.9 kg/m2 as overweight.

Pilot study

The questionnaire was tested on 20 patients as a pilot study to evaluate the internal consistency and determine the time needed to fill the questionnaire. The pilot study was conducted through one week on (April/2017)

Data management and analysis:

After data collection, the data was entered, organized, tabulated and analyzed using the standard computer program SPSS version 21 Continues data was expressed as Mean (±SD), while categorical data was expressed as frequency and percentage. Student t-test was used to measure the difference between means of two continues variables, while Chi-square ($\chi 2$) was used to assess the relationship between two categorical variables, with the significant level set at $p< 0.05$.

3. Result

Patients' demographics

The demographic and baseline characteristics of the study population are presented in Table 1. A total of 291 patients were included in the study. The proportion of male to female was 1:1.4. Among the six age groups, patients aged between 50 and 59 (n=65) accounted for 22.34%. Compared to males, all females were non-smokers (100.00%). In those who were unemployed, there were 14.71% males compared to 86.30%. There were no significant differences in the presence of diseases between men and women.

Table 1: Demographic and baseline characteristics of patients

Variable	Male (n=136)	Female (n=155)	P-value
Age group			
20-29 years	28 (20.59%)	26 (16.77%)	
30-39 years	34 (25%)	24 (15.48%)	
40-49 years	26 (19.12%)	33 (21.29%)	0.123
50-59 years	22 (16.18%)	43 (27.74%)	

60-60 years	18 (13.24%)	22 (14.19%)	
≥ 70 years	8 (5.88%)	7 (4.52%)	
Smoking			
Never smoked	78 (57.35%)	155 (100.00%)	<0.001
Current smoker	32 (23.53%)	0.00	
Ex-smoker	26 (19.12%)	0.00	
Marital status			
Single	16 (11.76%)	23 (14.84%)	0.003
Married	120 (88.24%)	118 (76.13%)	
Divorced	0 (0.00)	5 (3.23%)	
Widowed	0 (0.00)	9 (5.81%)	
Current Job			
Field	58 (42.65%)	9 (5.81%)	<0.001
Office	30 (22.06%)	14 (9.03%)	
Unemployed	20 (14.71%)	126 (81.29%)	
Retired	26 (19.12%)	5 (3.23%)	
Not recorded	2 (1.47%)	1 (0.65%)	

Patients' clinical data

Patients' clinical data are presented in Table 2. Although females were presented with more hypertension, and other chronic diseases than that in males, (32.90% vs 23.52%), and (20.00% vs 17.64%) respectively, the difference did not reach statistical significance, P>0.05. Compared to males, there were more females on diet restrictions. The means of height, weight, waist circumference, and hip circumference were significantly greater in males than females. Total cholesterol and HDL were significantly greater in females than males (5.26 vs 4.29 and 1.43 vs 1.15). The blood pressure values between both genders were not statically significant, except for diastolic as it was greater in men than women, p= 0.0014.

Table 2: Clinical data at baseline

Presence of Comorbidities	Male (n=136)	Female (n=155)	P-value
Hypertension	32 (23.52%)	51 (32.90%)	0.077
Diabetes	56 (41.20%)	56 (36.14%)	0.377
Other diseases	24 (17.64%)	31 (20.00%)	0.652
No disease	24 (17.64)	17 (10.96%)	0.437
Food Restriction			
Positive diet	14 (10.30%)	29 (18.70%)	0.080
Diet	24 (17.65%)	48 (30.98%)	0.019
Without diet	38 (72.05%)	78 (50.30%)	0.013
Obesity data			
Height (cm) (M± SD)	169.8 (± 6.1)	155.7 (± 9.60)	<0.001
Weight (kg) (M± SD)	84.2 (± 19.2)	75.51(±16.95)	<0.001
Waist circumference (cm) (M± SD)	109.67 (±23.64	94.95 (± 15.85)	0.0021
Hip circumference (cm) (M± SD)	115.29 (±24.30)	110.53 (± 13.13)	0.0359
Lab values			
Fasted blood sugar (mmol/L) (M± SD)	6.92 (±2.71)	7.24 (±3.39)	0.3827
Total cholesterol (mmol/L) (M± SD)	4.92 (± 1.23)	5.26 (± 1.05)	0.0145
HDL (mmol/L) (M± SD)	1.15 (± 0.33)	1.43 (±0.37)	<0.001
Triglyceride (mmol/L) (M± SD)	1.44 (± 0.79)	1.34 (±0.84)	0.3055
Blood Pressure			
Systolic (mmHg) (M± SD)	129.61 (± 15.68)	129.86 (± 20.7)	0.9098
Diastolic (mmHg) (M± SD)	75.27 (± 11.64)	71 (± 10.70)	0.0014

Prevalence of metabolic syndrome and associated risk factors

Table 3 represents the prevalence of metabolic syndrome and its associated factors. Nearly half of the identified females (52.26%) had metabolic syndrome compared to (44.12%) of the males. The difference between the two groups was statically significant (p=0.166). Out of those who had metabolic syndrome, patients (males and females) were most commonly to have 2 risk factors in addition to central obesity, Figures 1 and 2.

Table 2: Prevalence of metabolic syndrome and associated risk factors according to gender

Variable	Male (n=136)	Female (n=155)	P-value
Prevalence of metabolic syndrome	60 (44.12%)	81 (52.26%)	0.166
Number of risk factors in addition to central obesity according to the IDF criteria			0.550
1 risk factor	30 (22.06%)	31 (20.00%)	
2 risk factors	24 (17.65%)	28 (18.06%)	
3 risk factors	18 (13.24%)	22 (14.19%)	
4 risk factors	18 (13.24%)	31 (20.00%)	
No risk factors	46 (33.82%)	43 (27.74%)	

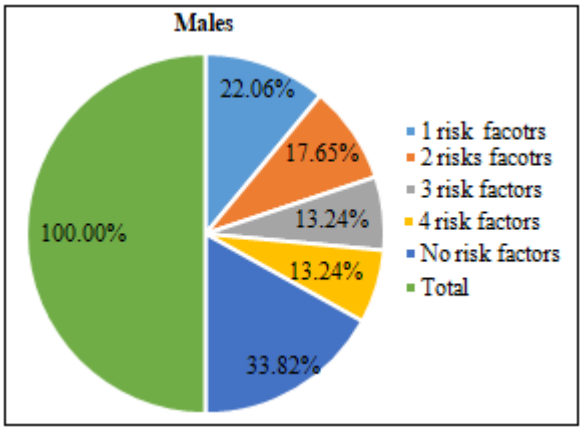

Figure 1: The proportion of risk factors associated with metabolic syndrome in males

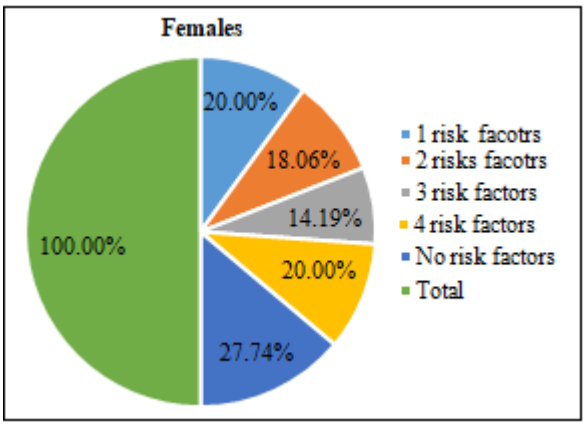

Figure 2: The proportion of risk factors associated with metabolic syndrome in females

Prevalence of metabolic syndrome according to different factors

Three-quarter of the studied group with metabolic syndrome aged more than 40 years and never smoked before and their

monthly income was less than 10,000 SR. ((75.18%, 78.72% & 72.34% respectively). More than half of the studied group with metabolic syndrome (59.57%) were unemployed regarding current employment.

Table 4: Prevalence of metabolic syndrome according to different factors

Variable	*Prevalence of Metabolic syndrome (n=141)*
Age group (Years)	
20-29 years	7 (4.96%)
30-39 years	20 (14.18%)
40-49 years	33 (23.40%)
50-59 years	42 (29.79%)
60-60 years	31 (21.99%)
≥ 70 years	8 (5.67%)
Smoking	
Never smoked	111 (78.72%)
Current smoker	14 (9.93%)
Ex-smoker	16 (11.36%)
Income status (SR)	
<5000	41 (29.08%)
5000-	61 (43.26%)
10000-	34.16 (24.11%)
15000-	5 (3.55%)
>20000	0 (0.00%)
Current Job	
Field	18 (12.77%)
Office	19 (13.48%)
Unemployed	84 (59.57%)
Retired	20 (14.18%)

4. Discussion

This present study is an important addition in the literature available regarding metabolic syndrome. Literature search revealed that there were not many studies published on this topic from the Arab world, but some were from the Middle East, especially from Jordan, Palestine, morocco etc. Moreover, few studies were found from Saudi Arabia and none from the eastern region to the authors' best knowledge. The study was planned to present the prevalence of metabolic syndrome among the adult population living in the Eastern region of Saudi Arabia. By using the 2005 IDF criteria, it was found from the analysis that the prevalence of metabolic syndrome was 48.5%, in which 44.12% males and 52.26% females were affected. The prevalence found in the current study was quite high compared to the studies published from other Saudi Arabia cities. Barrimah et al reported the prevalence of syndrome was 31.4% among the Qassim university personnel in 2009 (14). In Jeddah, a study conducted in 2012 and reported 21% prevalence rate (13). Furthermore, studies from Jordan and the United Arab Emirates found the prevalence of 36.3% and 40.5%, respectively (15,16).

Present study results also presented that the prevalence of metabolic syndrome was significantly high among adults between 40 and 60. Studies showed the same trend that increased the prevalence of metabolic syndrome as age increases, especially after 40 (15,16). Age-related increase in body size, abnormal body fat distribution, and insulin resistance are thought to be responsible for the increased prevalence of metabolic syndrome with age, especially among postmenopausal women (17). If we study more about the relationship of age and MetS, it was found that IDF definition identifies more cases of MetS in younger ages compare to NCEP which identifies more cases in older ages. Hence, IDF definition is important to prevent MetS at early ages before the onset of CVD. This suggests that IDF definition might be more suitable than NCEP definition.

Al-Nozha et al study found the significantly high prevalence of metabolic syndrome among females (18) and it is similar to our findings where 52.26% females had metabolic syndrome. In contrary, Al-Zahrani et al found that prevalence of metabolic syndrome among males (22.8%) was higher than females (13.8%) (14). Prevalence of high metabolic syndrome among female participants compared to male participants could be due to prevailing social cultural factors that promote sedentary lifestyle and physical inactivity. Women spent most of their time at homes and very limited access to sports and other physical activities.

Furthermore, over 80 percent of housekeepers were females, and the prevalence of metabolic syndrome among housekeepers was significantly high, revealing that mostly female housekeepers were having metabolic syndrome. This finding is quite understandable if it correlates with culture and social restrictions, because of cultural and social bindings Saudi women are less likely to go to the gym for exercise or even for jogging at streets. This finding is similar to the study conducted in Jordan (15).

Hypertension and diabetes were included as comorbidities, and it was found that a higher number of female participants was suffering from hypertension compared to male participants. Harzallah et al used 2005 IDF criteria to study metabolic syndrome and its comorbidities and they found that more female participants (61.7%) were having hypertension then male (58.3%) participants (19). Furthermore, some studies found that low HDL cholesterol was the most common abnormality in men (62.7%) agrees with that reported among Arab Americans, Palestinians and Omani adults (9-11).

Small size was not sufficient to generalize the results and it was one of the limitations of the study. The number of males and females are not equal, and the BMI of the participants was not calculated to characterize the obesity level among the participants. Although the protocol stats that blood samples had to be obtained while the patient was in a fasted state, the authors did not know either the patient came to the hospital with fasting.

Repetition of this kind of studies after some interval of time can help track the prevalence of metabolic syndrome. Through the finding of its trend can guide to evaluate the effectiveness of its prevention program. Furthermore, region wise or longitudinal studies are also helpful in this regard, prevalence of metabolic syndrome can be different in various areas within a country because of variation in life style, eating habits and social life.

5. Conclusion

In summary, despite the literature supporting the increased prevalence of metabolic syndrome, the overall prevalence of metabolic syndrome in our study did not differ between males and females. However, their prevalence of metabolic syndrome can be reduced by increasing public awareness about the syndrome. Further, the risk factors associated with metabolic syndrome can be controlled through lifestyle modification, daily exercise or sporting activity and/or medical intervention. Finally, reduction in energy diet is an effective and healthy way to reduce weight, consisting of a modest 500 to 1000 calories/day.

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