

## Age and Sex Differences among Patients with Metabolic Syndrome in Hadhramout, Republic of Yemen

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### Abstract

The aim of our work is to determine the frequency of metabolic syndrome with age and sex difference analysis. This is a cross-sectional study conducted at Al-Rayan Hospital, Mukalla, Hadhramout, Republic of Yemen, from 4/2013 to 10/2014. Metabolic syndrome was estimated according to the International Diabetes Federation (IDF) criteria. of 702 patients, 239 were diagnosed as metabolic syndrome (34%), females were more than males (52.7%, 47.3% respectively), and the mean age of males was significantly higher than that of females. Raised waist circumference was present in all cases, and was higher in males, followed by diabetics with no significant difference. This was followed by hypertension, systolic and diastolic blood pressures were significantly higher in males, followed by triglycerides which was non-significantly higher in males, the least frequent component was HDL which was significantly lower in males than females. A percentage of 50% and or more of males and female patients had four metabolic syndrome components. The percentage of metabolic syndrome was 34%. It was more common in females which affected by the syndrome earlier in age than males. Most patients had more than three component of the syndrome.

**Keywords:** metabolic Syndrome, Age, Sex, Hadhramout, Yemen.

### Introduction:

The metabolic syndrome (MetS) is a cluster of various cardiovascular disease risk factors: diabetes (DM) and prediabetes, abdominal obesity, hyperlipidemia and high blood pressure (24). It is a major and escalating public-health and clinical challenge worldwide in the wake of urbanization, surplus energy intake, increasing obesity, and sedentary life habits. MetS confers a 5-fold increase in the risk of type 2 DM and 2-fold the risk of developing cardiovascular disease over the next 5 to 10 years (3). Further, patients with the MetS are at 2- to 4-fold increased risk of stroke, a 3- to 4-fold increased risk of myocardial infarction, and 2-fold the risk of dying from such an event, compared with those without the syndrome (4), regardless of a previous history of cardiovascular events (32).

Although there are many studies targeting MetS in the neighboring countries (5,6,15,34,37), no data about that in the Republic of Yemen; and especially Hadhramout. So our aim to carry out this study was to determine the frequency of MetS with age and sex comparison in Hadhramout.

### Patients and Methods:

This cross-sectional study was carried out at the medical out patient clinic, Al-Rayan Specialized Hospital, Mukalla, Hadramout, Republic of Yemen, during the period from April 2013 to October 2014 (1.5 year). Patients were involved in after applying the following excluding criteria:

- Type 1 DM.
- Secondary DM or hypertension.
- Any evidence of non-diabetic or non-hypertensive renal disease, or severe renal disease.
- Severe heart failure (New York Heart Association class III or more).
- Liver disease.
- Pregnancy.

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All patients underwent detailed history taking and clinical examination, including measurements of height, weight, waist circumference, and blood pressure. Fasting venous blood was sampled from an antecubital vein from all patients for the measurement of plasma glucose (FPG), high-density lipoprotein (HDL), triglycerides (TGs), urea and creatinine. For diagnosis of MetS, international Diabetes Federation (IDF) criteria (23) were used, which states:

Waist circumference (WC)  $\geq 94$  cm in men,  $\geq 80$  cm in women), together with two of the following:

1. Blood Pressure: Systolic (SBP)  $\geq 130$  mmHg, diastolic (DBP)  $\geq 85$  mmHg or treatment of previously diagnosed HTN.
2. FPG  $\geq 5.6$  mmol/l ( $\geq 100$  mg/dl) or previously diagnosed type 2DM.
3. HDL  $< 1.03$  mmol/l ( $< 40$  mg/dl) in men,  $< 1.29$  mmol/l ( $< 50$  mg/dl) in women
4. TGs  $\geq 1.7$  mmol/l ( $\geq 150$  mg/dl).

The sample size was estimated on a single population proportion formula using a confidence interval of 95% (95% CI) and a 35.3% previous prevalence of MetS in Saudi Arabia (5) the following formula(39,40):

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2}$$

Wherein= the minimal sample size,  $Z_{\alpha/2}$  = Critical value at 95% confidence interval (95%CI) (1.96), P= proportion of patients who may have MetS (35.3%) and d= assumed marginal error (5%). Based on the above formula, the minimal sample size was 351, but we preferred to double it to be 702 patients participating in the study to strengthen outputs.

For statistical analysis of the results, statistical package SPSS version 20 was used. Data were presented in Mean $\pm$ SD and frequencies. Statistical significance of difference of means was calculated through independent sample *t*-test. Chi square test was used where two categorical variables were compared. Statistical significance was considered when *p value*  $< 0.05$ .

Ethically, after taking the permission from the hospital manager; a written agreement consent to participate in the study was taken from the most patients, while others especially illiterate and elderly ones agreed verbally.

### Results:

From the total 702 patients completed the study, 239 (34%) patients of them fulfilled the IDF criteria for MetS diagnosis. From them; females(52.7%) were more than male patients (47.3%) but with no significant difference. Fifty-four percent of females were  $< 50$  years (16.7%  $< 40$  years + 37.3% 40-49 years), while only 29.2% of males from the same age groups (5.3%  $< 40$  years + 23.9% 40-49 years), 12 males aged  $\geq 70$  years (10.6% of males) had MetS, while no females from the same age group. So MetS appeared earlier among females and younger females and older males were more suffered from MetS (Table 1).

The male age mean was  $61.5 \pm 9.8$  years which was significantly higher than that of female  $55 \pm 8.8$  years. Waist circumference was also significantly higher in males than in females ( $100.7 \pm 5.8$  versus  $96.9 \pm 6.9$  cm respectively). Systolic and DBP were also significantly higher in males. Serum HDL- cholesterol was significantly lower in males than in females ( $39.4 \pm 7.1$ , versus  $41.6 \pm 9.4$  mg/dl respectively), while serum TGs and FBG were higher in females compared with males but they were non-significant (Table 2).

The frequency of each MetS component among patients was studied. 99.2% of females had DM compared with 92.9% of males with statistical significance (*p value* 0.002), hypertension and TGs were more in males while HDL was more in females; but all these components showed no significance (Table 3).

The distribution of IDF criteria among both sexes revealed that  $\geq 50\%$  of patients had 4 criteria, 56.6% of males and 50% of females, 28.3% of males and 28.6% of females were having the all the 5 criteria, while only 15% of males and 21.4 of females were with 3 criteria (Figure 1).

### **Discussion:**

The incidence of MetS is rising worldwide. This is partly due to the significant increase in the prevalence of obesity (38). The etiology of the metabolic syndrome is multifactorial such as the high prevalence of excess body fat, abnormal body fat distribution, hypertriglyceridemia, and insulin resistance, these risk factors might begin at a young age and its high frequency has been consistently recorded in Asian populations irrespective of their geographic locations.(29) Furthermore, increasing energy consumption, decreasing energy expenditure, or combination of both has led to a positive energy balance and a marked increase in weight (17). International data indicate that the epidemic of metabolic syndrome is not merely confined to the western world but is, in fact ,a global health problem (29); observational cross-sectional studies as well as demographic health surveys from the Middle East pointed out that the prevalence of obesity increases from an average of 6% in healthy children to 20% in adolescent males and to a further 23% in elderly patients (15).

This study involved 702 of individuals, 239 (34%) of them were diagnosed according to IDF as MetS patients. The prevalence of MetS varies widely, which can be explained by the effect of factors that may lead to it such as urbanization, socioeconomic level, high-calorie diets and sedentary life. So in general, the prevalence is high in developed counties and those developing countries with high socioeconomic level; in USA it reached <40% of population, and nearly 30% in Europe (11,17), while in developing countries, the figures were less (11,14,30,35). Our study finding was 34%, but in some countries in the region, they reported higher prevalence, at 37-44% (5,6,15,24,34); the highest reported in our region was in Jordan (51%) (25).

Many studies worldwide revealed that females were more affected than males (1,2,13,18,30,34).The findings of the present study were in agreement with such findings, but some studies reported that males and females affected equally (9,10),while others revealed that males were more affected (8,12,36), most studies among Asian populations reported males were more affected (7,16,20,22,27,28,41) which may be attributable to genetic and environmental factors they share.

The risk of MetS increases with increasing age (30,35), affecting less than 10% of people in their 20s and 40% of people in their 60s (19), and recently Nolan et al, in a pooled analysis reported only 5-7% among young adult (31). In the present work, men were older compared with women, which was agreed with Ahmed et al, (2) and Kiani et al., (26), while Motala et al, (35) showed no age difference.

The WC is the milestone for MetS diagnosis according to IDF criteria, so all patients had raised WC, which was higher in males than females, and this is interpreted by the IDF criteria which documented a higher figure for male than female, i.e.  $\geq 94$  cm in men,  $\geq 80$  cm in women (23). The frequency of MetS components that followed WC in this study was arranged as the following; DM, HTN, TGs, and HDL which was the least frequent one for the males, and the same regarding females except that HDL and TGs changed their arrangement for each other.The same findings were reported by Ahmed et al., (1), while Imam et al (21) revealed that DM was followed by HDL, TGs and hypertension was the least frequent. A more recent study done by Kiani and colleagues (26) reported that the frequency of MetS components were arranged as DM, HDL, WC, hypertension and TGs the least frequent, these variations may be attributed to genetic and environmental, as well as the selection of samples and their size.

Fifty percent or more of males and females had four MetS components and about 30% had five. Patients with only three components were the least frequent, in contrast to Ahmed et al, (1) and Imam et al, (21) who found that patients with three components had the highest frequency. This made a sound for us that our people have higher risk for coronary artery diseases and stroke, and primary and secondary prevention must be more effective.

**Conclusion:**

The frequency of metabolic syndrome was 34%. It was more common in females affecting them at earlier age compared to males. Most patients were having more than three IDF criteria. Waist circumference followed by diabetes was the most frequent components of metabolic syndrome. Males had significantly higher WC, SBP, DBP, non-significant higher TGs and significant lower HDL.

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**Table 1: Age and Sex Distribution of Patients with Metabolic Syndrome (N=239)**

Sex \ Age	Male (n=113)		Female (n=126)		Total	
	No.	%	No.	%	No.	%
<40 years	6	5.3	21	16.7	27	11.3
40-49 years	27	23.9	47	37.3	74	31
50-59 years	32	28.3	39	31	71	29.7
60-69 years	36	31.9	19	15.1	55	23
≥70 years	12	10.6	0	0	12	05

**Table (2): Parameters of Patients with Metabolic Syndrome in Relation to Sex(N=239)**

Clinical Parameters	Male (n=113)		Female (n=126)		P value
	Mean±SD <sup>1</sup>	(95% CI) <sup>2</sup>	Mean±SD	(95% CI)	
Age (years)	61.5 ± 9.8	(59.7 - 63.4)	55±8.8	(53.4 - 56.5)	< 0.01*
Waist circumference (cm <sup>3</sup> )	100.7±5.8	(99.6 - 101.7)	96.9±6.9	(95.7 - 98.2)	< 0.01*
Systolic blood pressure (mm.Hg)	145±13.3	(142.6 - 147.5)	140.6±10.7	(138.7 - 142.4)	< 0.05*
Diastolic blood pressure (mm.Hg)	90.1±6.3	(88.9 - 91.3)	87.1±6	(86 - 88.2)	< 0.01*
Serum triglycerides (mg/dl)	151.1±14	(148.5 - 153.7)	154.4±13	(152.2 - 156.8)	<0.05
Serum HDL <sup>4</sup> (mg/dl)	39.4±7.1	(38.1 - 40.7)	41.6±9.4	(40 - 43.3)	< 0.05*
Fasting plasma Glucose (mg/dl)	130.4±14.3	(127.8 - 133)	134.2±15.9	(131.4 - 137)	<0.05

<sup>1</sup>Standard deviation <sup>2</sup>95% Confidence interval <sup>3</sup>Centimeter

<sup>4</sup>High-density lipoproteins

\* Statistically significant (p value calculated by T-test)

**Table 3: Frequency of the components of the metabolic syndrome (N=239):**

Item	Male (n=113)		Female (n=126)		P value	
	No.	%	No.	%		
Diabetes mellitus	Yes	105	92.9%	125	99.2%	0.002*
	No	08	7.1%	01	0.8%	
Hypertension	Yes	104	92%	111	88.1%	0.21
	No	09	08%	15	11.9%	
TGs <sup>1</sup>	Normal	70	61.9%	77	61.1%	0.5
	High	43	38.1%	49	38.9%	
HDL <sup>2</sup>	Normal	62	54.9%	78	61.9%	0.17
	Low	51	45.9%	48	38.1%	

<sup>1</sup>Triglycerides <sup>2</sup>High-density lipoproteins\* Statistically significant (p value calculated by Chi square test)

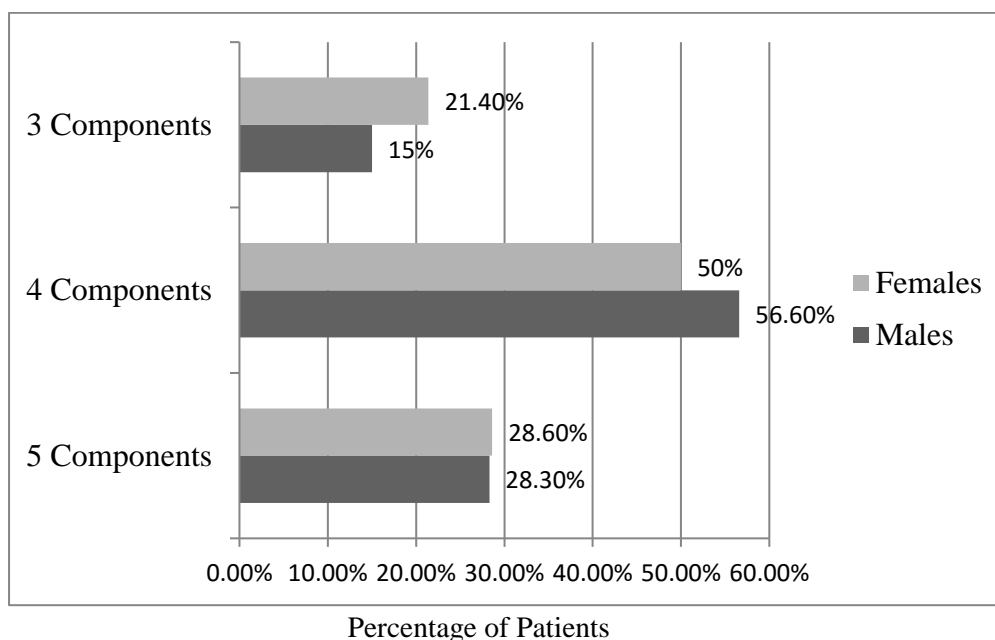


Figure (1): Number of the Criteria of Metabolic Syndrome in Relation to Sex

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## مقارنة السن والجنس في مرضى متلازمة الأيض في حضرموت - الجمهورية اليمنية

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### الملخص

الهدف من هذه الدراسة هو معرفة نسبة انتشار متلازمة الأيض مع دراسة الاختلافات بين المرضى حسب السن والجنس. وهي مقطعية عرضية اجريت في مستشفى الريان التخصصي بالمكلا- حضرموت-الجمهورية اليمنية بين 2013/4 الى 2014/10. متلازمة الأيض تم تقديرها حسب معايير الفيدرالية الدولية للسكري. من 702 حالة شخصت 239 منها بالمتلازمة (34%) وكان النساء اكثر نسبة إصابة من الرجال (52.7%)، (47,3%). متوسط عمر الرجال أعلى منه عند النساء اي ان النساء يصبن بالمتلازمة في سن اصغر من الرجال. محيط الخصر كان مرتفعا عند جميع المرضى وكان اعلى عند الرجال، يليه السكري ثم ارتفاع ضغط الدم والضغط الانقباضي والانبساطي بفروقات ذات دلالة احصائية عند الرجال. ثم الدهون الثلاثية وكانت مرتفعة بدون دلالة احصائية عند الرجال اما اقل معايير الفيدرالية ظهورا فكان البروتين الدهني عالي الكثافة وكان اقل بوجود دلالة احصائية في تركيزه عند الرجال منه عند النساء. خمسون في المئة واكثر من الرجال والنساء كان لديهم 4 من مكونات المتلازمة. من هنا نستنتج ان نسبة اصابة متلازمة الأيض 34% ويصيب النساء اكثر من الرجال وفي سن اقل منهم. كما ان معظم المرضى لديهم أكثر من ثلاثة من مكونات المتلازمة.

**الكلمات المفتاحية:** متلازمة الأيض، السن، الجنس، حضرموت، الجمهورية اليمنية