

## Prevalence of Metabolic Syndrome among Hypertensive Patients in Hadhrumout, Republic of Yemen

Rasheed Mohammed Bamekhlah\*

Hussain Saeed Alghazali\*

### Abstract

The aim of this study was to determine the prevalence of metabolic syndrome among hypertensive patients. A cross-sectional study conducted at Al-Rayan Specialized Hospital, Mukalla, Hadramout during (2/2015 - 4/2016). From 345 patients, 207 were diagnosed as metabolic syndrome (60%), with mean age (57.9±9.2) years was significantly higher than that of patients without the syndrome (44.7±6.6) years ( $p < 0.0001$ ). Females with the syndrome were significantly higher than males (67.6% and 32.4% respectively) compared with patients without, ( $p < 0.0001$ ). As Hypertension was present in all studied patients, diabetes was the commonest metabolic syndrome component in patients with the syndrome (79.2%), followed by the high waist circumference (76.3%), then high triglycerides (66.2%) and the least was low HDL (59.9%). There was 58% of patients with metabolic syndrome had four metabolic syndrome components, 32.8% with five and only 7.2% had only three components. The prevalence of metabolic syndrome among hypertensive patients was high. It was more common in females and older age. Diabetes and the central obesity were the most frequent syndrome components. More than half of patients had four components, but a considerable number of patients were with the all the five components.

**Keywords:** Metabolic Syndrome, Hypertension, Diabetes, Hadramout, Yemen.

### Introduction:

Hypertension (HTN) and Metabolic syndrome (MetS) are highly prevalent diseases that present a global challenge [9,16]. In 2000, approximately 1 billion people worldwide (26.4% of the adult population) were estimated to have HTN and this is likely to increase to over 1.5 billion by 2025 as a result of aging population in many developed countries, and an increasing incidence of HTN in developing countries [16]. It is estimated that around 20-25% of the world's adult population has MetS and they are twice as likely to die from it; and they are three times more likely to have a heart attack or stroke compared with people without the syndrome [33]. When HTN and MetS components co-exist in an individual they potentiate one another leading to synergism that increase the total risk [24]. Hypertension is one of the major manifestations of the group of clinical abnormalities that characterize MetS [19]. Use of some antihypertensive agents like diuretics or  $\beta$ -adrenergic blocking agents may worsen insulin resistance and increase the risk of developing cardiovascular disease [15].

Even though there are different studies done on the prevalence of MetS in different parts of the world [14,15,25,35], in neighbour countries [2,3,6,26]; and few reports on MetS in the area were specifically performed among hypertensive

individuals [29]. In Republic of Yemen, only three published studies were performed on MetS [1,4,7], in the fourth study was our work in Hadramout [5]. Hence, the aim of this study was to determine the prevalence of MetS among hypertensive patients in Hadramout.

### Subjects and Methods:

This prospective cross-sectional hospital-based study was carried out at the medical department and outpatient clinic of Al-Rayan specialized Hospital, Mukalla, Hadramout, Republic of Yemen, during the period from February 2015 to April 2016. Previously hypertensive patients were submitted to the study after exclusion criteria had been applied, which were: Type 1 diabetes mellitus (DM), secondary DM or HTN, 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, and pregnancy.

Ethically, a written consent from most patients or his/her guardian was taken as an agreement to participate in the study, few patients were illiterate or old and verbal agreement was declared.

All patients underwent detailed History taking and clinical examination, including measurements of weight, waist circumference (WC), 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.

\* Department of Medicine, College of Medicine and Health sciences (HUCOM), Hadramout University, Mukalla, Hadramout, Republic of Yemen. Received on 22/11/2017 and Accepted for Publication on 7/5/2018

Metabolic syndrome was diagnosed, according to The National Cholesterol Education Program (NCEP), Adult Treatment Panel III (ATP-III), in patients fulfilling three or more of the following [11]:

- 1- Abdominal obesity (waist circumference > 102 cm in men and > 88 cm in women).
- 2- TGs >1.7 mmol/l (150 mg /dl),
- 3- HDL <1.04 mmol/L [40 mg/dL] for men and <1.30 mmol/L [50 mg/dL] for women)
- 4- High fasting plasma glucose (FPG)  $\geq 6.1$  mmol/L [ $\geq 110$  mg/dL] or taking anti-hyperglycemic drugs).
- 5- High blood pressure (systolic blood pressure  $\geq 130$  mmHg or diastolic blood pressure  $\geq 85$  mmHg or taking antihypertensive drugs).

The sample size was estimated using the formula for descriptive study ( $n = Z\alpha^2 \times p \times q / d^2$ ) [10], where n is the sample desirable,  $Z\alpha$  is the confidence level at 95% (1.96), d is the desirable precision at 5% (0.05), p is the previous prevalence of MetS in hypertensive patients in Kuwait; (34%) [29], q is 1-p which is equal to 0.66. Based on the above formula, the minimal sample size was 345. Then, systematic sampling

was applied and every second a participant was selected using systematic random sampling technique.

Data were processed by The Statistical Package for Social Sciences (SPSS) software version 20.0 (IBM Corporation, Armonk, NY, USA). The paired "t" test was applied to compare means and Pearson's *chi-square* test to compare gender and MetS components. Also we estimated odds ratio (OR) and the resulting confidence interval (95% CI) for all categorical variables. All statistical hypothesis tests were 2-sided, and *p* values <0.05 were considered statistically significant. Microsoft office Excel 2010 was used to form the figures.

### Results

On the basis of ATPIII criteria [11], 60% (207 / 345) patients fulfilled the criteria for MetS and 138 (40%) without MetS (Figure1). The mean age of Mets patients was (57.9 $\pm$ 9.2) years, and was highly significant comparing with patients without the syndrome (44.7 $\pm$ 6.6) years. All means of the five components of MetS were significantly higher in MetS patients than those of non-MetS ones (Table 1).

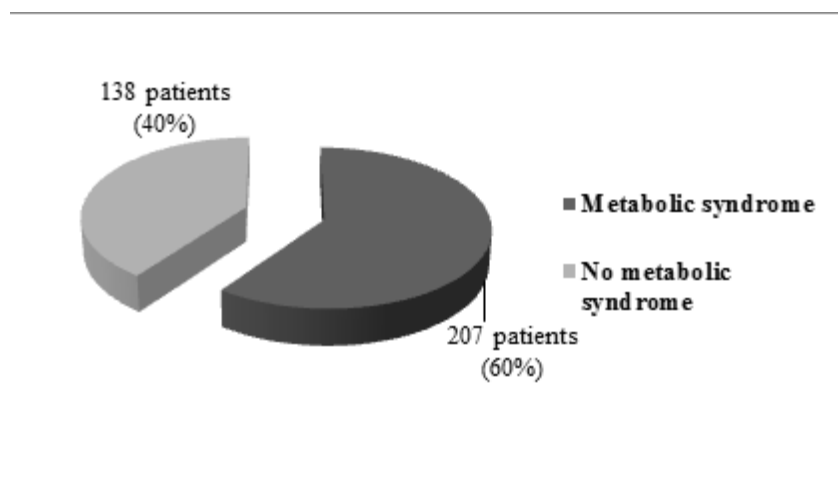


Figure 1: Patients with and without Metabolic Syndrome (N=345)

**Table 1 Parameters of patients with and without Metabolic Syndrome**

| Parameter                         | Metabolic syndrome (N=345) |                           | P value  |
|-----------------------------------|----------------------------|---------------------------|----------|
|                                   | Yes (n=207)<br>Mean ± SD   | No (n= 138 )<br>Mean ± SD |          |
| Age (years)                       | 57.9 ± 9.2                 | 44.7±6.6                  | < 0.0001 |
| WC <sup>1</sup> (cm) <sup>2</sup> | 99.2±6.3                   | 85.6±5                    | < 0.0001 |
| SBP <sup>3</sup> (mm.Hg)          | 145±11.1                   | 142.1±14.1                | 0.037    |
| DBP <sup>4</sup> (mm.Hg)          | 89.8±5.9                   | 88.3±6.8                  | 0.035    |
| TGs <sup>5</sup> (mg/dl)          | 154.1±13.3                 | 124.8±11.9                | < 0.0001 |
| HDL <sup>6</sup> (mg/dl)          | 41.8±8.7                   | 49±4.8                    | < 0.0001 |
| FPG <sup>7</sup> (mg/dl)          | 132.2±15.1                 | 97.2±5.1.                 | < 0.0001 |

<sup>1</sup>Waist Circumference <sup>2</sup>centimeters <sup>3</sup>Systolic Blood Pressure <sup>4</sup>Diastolic Blood Pressure <sup>5</sup>Triglycerides <sup>6</sup>High-Density Lipoprotein <sup>7</sup>Fasting Plasma Glucose

Females (140, 67.5%) were significantly higher than males with MetS (67, 32.4%), [OR 0.28, 95% CI (0.18-0.44),  $p < 0.0001$ ]. After HTN, DM was the most common MetS component in MetS patients (164, 79.2%), followed by high WC (158, 76.3%), high TGs (137, 66.2%), and low HDL (124, 59.9%) was the least frequent MetS component. All these components were higher in frequency among MetS patients

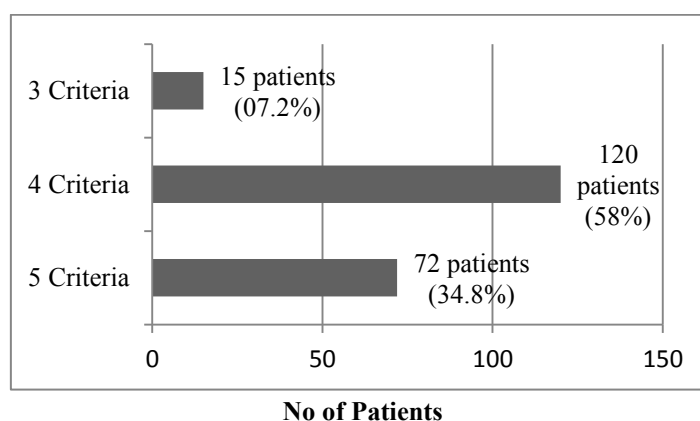
comparing non-MetS patients with statistical significance, and they had stronger association with MetS than non-MetS patients with logistic regression; diabetes [OR 2.24(1.38-3.62)95% CI (1.38-3.62),  $p = 0.0009$ ], high WC [OR 2.01, 95% CI (1.23-3.27),  $p < 0.0001$ ], raised TGs [OR 4.04, 95% CI (2.56-6.39),  $p < 0.0001$ ], and low HDL [OR 6.75, 95% CI (4.04-11.3),  $p < 0.0001$ ] (Table 2).

**Table 2 Frequency of Gender and Components of Metabolic Syndrome**

|     |                         | Metabolic syndrome (N=207) |              | OR <sup>1</sup> (95% CI) <sup>2</sup> | P value  |
|-----|-------------------------|----------------------------|--------------|---------------------------------------|----------|
|     |                         | Yes (n=207)                | No (n= 138 ) |                                       |          |
| Sex | Male                    | 67 (32.4%)                 | 51(37%)      | 0.28 (0.18-0.44)                      | < 0.0001 |
|     | Female                  | 140 (67.6%)                | 87(63%)      |                                       |          |
|     | High WC <sup>3</sup>    | 158 (76.3%)                | 39 (44.3%)   | 2.01(1.23-3.27)                       | < 0.0001 |
|     | Diabetes                | 164(79.2%)                 | 87(63%)      | 2.24(1.38-3.62)                       | 0.0009   |
|     | Raised TGs <sup>4</sup> | 137(66.2%)                 | 45(32.6%)    | 4.04(2.56-6.39)                       | < 0.0001 |
|     | Low HDL <sup>5</sup>    | 124(59.9%)                 | 25(18.1%)    | 6.75(4.04-11.3)                       | < 0.0001 |

<sup>1</sup>Odds Ratio. <sup>2</sup>95% Confidence Interval. <sup>3</sup>Waist circumference. <sup>4</sup>Triglycerides. <sup>5</sup>High-density lipoprotein.

Regarding the distribution of MetS patients, 120 (58%) had 4 Components (criteria) of MteS, 72 (34.8%) had 5 components, and only 15 (7.2%) were with 3 components. (Figure2).



**Figure 2 Distribution of Patients according to Number of Metabolic syndrome Components**

#### Discussion:

This study showed a high prevalence of MetS among hypertensive patients attending follow-up at the medical clinic and department of Al-Rayan Specialized Hospital, using the NCEP-ATP criteria (60%). Although many studies worldwide were in the range of 30-50% [17,18,21,23], higher figures were reported [12,30]. This variation was also recorded in the same region, in the Middle East, Yasin et al. [34] in Jordan reported about twice than Sorkhou et al. [29] in Kuwait (65% and 34% respectively). In India, Govindula et al. [12], Thakur et al. [32], and Salegre et al. [27], found that the prevalence of MetS were (82.5%, 68.6% and 49% respectively). The possible explanations for the variation could be genetic disparities between populations, ethnicity, socio-demographic characteristics, lifestyle, duration of HTN and experiences of antihypertensive treatment. Recently Tedewos et al, found that the prevalence of MetS in urban inhabitants was 82.8% [31], therefore, it calls for a critical attention to create awareness for individuals living in urban situation concerning how to modify their life style in order to limit/prevent MetS risks.

This study revealed that MteS patients were older than the non-MetS, with female predominance, and this was supported by many studies [20,28], the syndrome affecting less than 10% of people in their 20s and 40% of people in their 60s [13] and recently Nolan et al, in a pooled analysis reported only 5-7% among young adult [22].

The frequency of each MetS component among hypertensive patient was variable, the most frequent MetS component among MetS patients in this work after HTN was DM, followed by high WC, high TGs and the least frequent was low HDL, Selagre et al, in India, [27] was very similar to our findings except that WC and TGs replaced their arrangements, but in many studies around the globe, WC was the most frequent, and DM was the least [8,32,34,35].

More than 90% of our MetS patients had >3 components (58% with 4 and 34.8% with all the 5 components) while only 7.2% were with three components, while many studied showed that more patients were with three component, and the least were with 5 components (10.2-17%) [8,12,27,31], so, our people have a higher risk for coronary artery diseases and stroke, and primary and secondary prevention must be more effective.

#### Conclusion:

The prevalence of metabolic syndrome among hypertensive patients was 60%. It was more common in females and older age. Diabetes is the most common component followed by high waist circumference (central obesity), high serum triglycerides and least frequent one was the serum low HDL. Most patients had >3 components of the syndrome.

#### Acknowledgement:

Special thanks to Al-Rayan specialized Hospital, Mukalla, Hadramout, Republic of Yemen especially, the Medical Department residents who helped in data recording. And the laboratory staff of the hospital, for carrying out the tests.

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## المتلازمة الاستقلابية بين مرضى ارتفاع ضغط الدم في حضرموت- الجمهورية اليمنية

حسين سعيد الغزالي

رشيد محمد بامخله

### الملخص

كان الهدف من هذه الدراسة هو معرفة انتشار المتلازمة الاستقلابية عند مرضى ارتفاع ضغط الدم. وهي دراسة مقطعية أجريت في مستشفى الريان التخصصي بالمكلا حضرموت خلال الفترة 2015/2-2016/4م. من 345 مريضاً، 207 منهم تم تشخيصهم كمرضى بالمتلازمة الاستقلابية (60%) ومتوسط أعمارهم ( $57.9 \pm 9.2$ ) عام و هو أعلى بدلالة إحصائية عن متوسط أعمار المرضى بدون المتلازمة ( $44.7 \pm 6.6$ ) عام ( $p < 0.0001$ ) نسبة الإناث المرضى بالمتلازمة كانت أعلى وبدلالة من نسبة الذكور (67.6% و 32.4% على الترتيب) مقارنة بالمرضى بدون المتلازمة ( $p < 0.0001$ ). كون ارتفاع ضغط الدم لدى جميع المرضى، فإن داء السكري هو الأكثر نسبة بين مرضى المتلازمة (79.2%) يليه ارتفاع محيط الخصر (76.3%)، ثم ارتفاع الدهون الثلاثية (66.2%) وأقلهم هو نسبة انخفاض البروتين الدهني عالي الكثافة (59.9%). و كان 58% من مرضى المتلازمة لديهم أربعة من مكونات المتلازمة، و 32.8% لديهم خمسة، بينما 7.2% منهم فقط لديهم ثلاثة مكونات من مكونات المتلازمة. نسبة انتشار المتلازمة الاستقلابية عند مرضى ارتفاع ضغط الدم كان مرتفعاً. و هو أكثر بين الإناث و كبار السن. داء السكري والسمنة كانا الأكثر شيوعاً بين مكونات المتلازمة. أكثر من نصف المرضى كان لديهم 4 مكونات بينما هناك نسبة كبيرة منهم لديهم كافة مكونات المتلازمة الخمسة.

**الكلمات المفتاحية:** المتلازمة الاستقلابية، ارتفاع ضغط الدم، السكري، حضرموت، اليمن.