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Assessment of metabolic syndrome among known population: A community survey

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Abstract
Background: The metabolic syndrome is characterized by clustering of various interlinked risk factors such as abdominal obesity, hypertension, hyperglycemia, dyslipidemia, pro-inflammatory state, and a prothrombotic state. The present study was conducted to assess MetS among known population.
Materials & Methods: 280 subjects of metabolic syndrome (MetS) of both genders age ranged from 20-70 years were included. Body mass index (BMI), hip circumference (HC), waist circumference (WC), and blood pressure, fasting blood glucose (FBG), total cholesterol (TC), triglyceride (TG), low-density lipoprotein-cholesterol (LDL- C), and high-density lipoprotein-cholesterol (HDL-C) were estimated.
Results: The mean BMI (Kg/m^2) in males was 50.3 and in females was 48.1, SBP (mm Hg) was 128.4 in males and 126.4 in females, DBP (mm Hg) was 84.2 in males and 80.4 in females, TG (mg/dl) was 146.2 in males and 132.2 in females, cholesterol (mg/dl) was 185.2 in males and 186.2 in females, HDL-C (mg/dl) was 40.8 in males and 43.6 in females, LDL-C (mg/dl) was 118.2 in males and 116.0 in females and FBS (mg/dl) was 102.4 in males and 98.4 in females. The difference was non-significant ($P>$ 0.05). Age >40 years had 3.4 times, BMI (>25 Kg/m^2) had 4.6 times, cholesterol (>200mg/dl) had 1.5 times, hypertension had 2.31 times and diabetes had 5.39 times risk of metabolic syndrome.
Conclusion: The prevalence of metabolic syndrome and associated risk factors was high among male adults.

Keywords: Metabolic syndrome, total cholesterol, high-density lipoprotein

Introduction
The metabolic syndrome (MetS) is a major and escalating public-health and clinical challenge worldwide in the wake of urbanization, surplus energy intake, increasing obesity, oil- and sugar-rich dietary habits and sedentary life habits.[1] All these habits have pushed ethnic people to the forefront as contributors to cardiovascular disease (CVD) risk factors [2].
It is characterized by clustering of various interlinked risk factors such as abdominal obesity, hypertension, hyperglycemia, dyslipidemia, pro-inflammatory state, and a prothrombotic state. MetS confers a 5-fold increase in the risk of type 2 diabetes mellitus (T2DM) and 2-fold the risk of developing cardiovascular disease (CVD) over the next 5 to 10 years [3].
There have been several definitions of MetS, but the most commonly used criteria for definition at present are from the World Health Organization (WHO), the European Group for the study of Insulin Resistance (EGIR), the National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III), American Association of Clinical Endocrinologists (AACE) and the International Diabetes Federation (IDF) [4].
MetS is a state of chronic low- grade inflammation as a consequence of complex interplay between genetic and environmental factors. Insulin resistance, visceral adiposity, atherogenic dyslipidemia, endothelial dysfunction, genetic susceptibility, elevated blood pressure, hypercoagulable state, and chronic stress are the several factors which constitute the syndrome. MetS is a state of chronic low- grade inflammation with the profound systemic effects. Clinical identification and management of patients with the MetS are important to begin efforts to adequately implement the treatments to reduce their risk of subsequent diseases [5]. The present study was conducted to assess MetS among known population.

Materials & Methods
The present study comprised of 280 subjects of metabolic syndrome (MetS) of both genders. The age ranged from 20-70 years.

Subjects with self-reported pregnancy state, those using steroids, antibiotics, or require hospitalization and those who did not give written consent were excluded. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. The body mass index (BMI), hip circumference (HC), waist circumference (WC), and blood pressure were measured. Fasting venous blood samples were collected and various biochemical parameters such as fasting blood glucose (FBG), total cholesterol (TC), triglyceride (TG), low-density lipoprotein-cholesterol (LDL- C), and high-density lipoprotein-cholesterol (HDL-C) were used for the estimation. Definition of metabolic syndrome MetS was defined as the presence of ≥3 of the following five risk factors such as abdominal obesity: WC ≥90 cm in men and ≥80 cm in women, hypertriglyceridemia: triglycerides ≥150 mg/dL or on treatment (Rx) to lower triglycerides, Low HDL-C: <40 mg/dL in men and <50 mg/dL in women or on Rx to increase HDL-C, high blood pressure: systolic blood pressure (SBP) ≥130 mmHg and/or diastolic blood pressure (DBP) ≥85 mmHg or on antihypertensives and high fasting blood sugar (FBS): ≥100 mg/dL or on Rx for hyperglycemia. Results of the present study were subjected to statistical analysis. P value <0.05 was considered significant.

Results

Table 1: Distribution of subjects

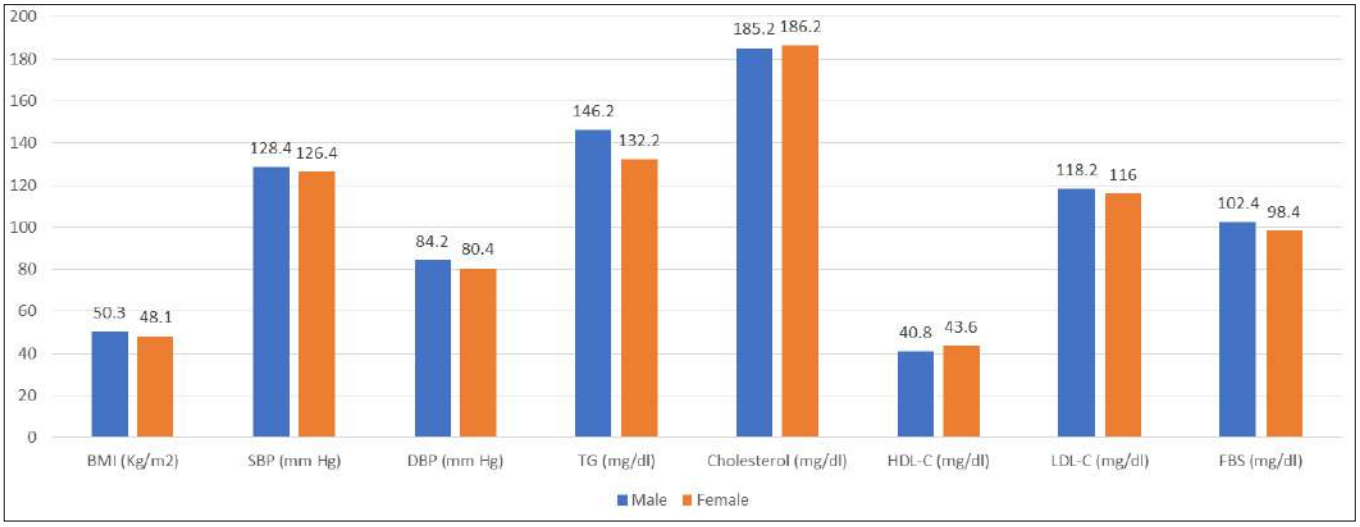
Total- 280		
Gender	**Male**	**Female**
Number	150	130

Table I shows that out of 280, males were 150 and females were 130.

Table 1: Comparison of parameters

Parameters	Male	Female	P value
BMI (Kg/m^2)	50.3	48.1	0.05
SBP (mm Hg)	128.4	126.4	0.92
DBP (mm Hg)	84.2	80.4	0.07
TG (mg/dl)	146.2	132.2	0.82
Cholesterol (mg/dl)	185.2	186.2	0.90
HDL-C (mg/dl)	40.8	43.6	0.04
LDL-C (mg/dl)	118.2	116.0	0.81
FBS (mg/dl)	102.4	98.4	0.02

Table II, graph I shows that mean BMI (Kg/m^2) in males was 50.3and in females was 48.1, SBP (mm Hg) was 128.4 in males and 126.4 in females, DBP (mm Hg) was 84.2 in males and 80.4 in females, TG (mg/dl) was 146.2 in males and 132.2 in females, cholesterol (mg/dl) was 185.2 in males and 186.2 in females, HDL-C (mg/dl) was 40.8 in males and 43.6 in females, LDL-C (mg/dl) was 118.2 in males and 116.0 in females and FBS (mg/dl) was 102.4 in males and 98.4 in females. The difference was non-significant (*P*> 0.05).



Graph 1: Comparison of parameters

Table 3: Odds ratio for different variables and metabolic syndrome

Variables	OR	P value
Age (>40 years)	3.4	0.012
BMI (>25 Kg/m^2)	4.6	0.04
Cholesterol (>200mg/dl)	1.5	0.02
Smoking	0.81	0.71
Alcohol	1.05	0.80
Hypertension	2.31	0.01
Diabetes	5.39	0.01

Table III shows that age >40 years had 3.4 times, BMI (>25 Kg/m^2) had 4.6 times, cholesterol (>200mg/dl) had 1.5 times, hypertension had 2.31 times and diabetes had 5.39 times risk of metabolic syndrome.

Discussion

Worldwide prevalence of MetS ranges from <10% to as much as 84%, depending on the region, urban or rural environment, composition (sex, age, race, and ethnicity) of

the population studied, and the definition of the syndrome used [6]. Insulin-resistant individuals demonstrate an impaired glucose metabolism or tolerance by an abnormal response to a glucose challenge, an elevated fasting glucose levels and/or overt hyperglycemia, or a reduction in insulin action after intravenous administration of insulin (euglycemic clamp technique) with decreased insulin-mediated glucose clearance and/or reductions in the suppression of endogenous glucose production [7]. The great variations in the susceptibility and age of onset in individuals with a very similar risk profile suggest a major interaction between genetic and environmental factors. A study by Aljada *et al*. [8] has shown that a high dietary fat intake is associated with an oxidative stress and an activation of the proinflammatory transcription factor, that is, nuclear factor kappa-beta (NFκB). The present study was conducted to assess MetS among known population.

In present study, out of 280, males were 150 and females were 130. The mean BMI (Kg/m^2) in males was 50.3 and in females was 48.1, SBP (mm Hg) was 128.4 in males and 126.4 in females, DBP (mm Hg) was 84.2 in males and 80.4 in females, TG (mg/dl) was 146.2 in males and 132.2 in females, cholesterol (mg/dl) was 185.2 in males and 186.2 in females, HDL-C (mg/dl) was 40.8 in males and 43.6 in females, LDL-C (mg/dl) was 118.2 in males and 116.0 in females and FBS (mg/dl) was 102.4 in males and 98.4 in females. Dyslipidemia is characterised by a spectrum of qualitative lipid abnormalities reflecting perturbations in the structure, metabolism, and biological activities of both atherogenic lipoproteins and antiatherogenic HDL-C which includes an elevation of lipoproteins containing apolipoprotein B (apoB), elevated TGs, increased levels of small particles of LDL, and low levels of HDL-C. Insulin resistance leads to an atherogenic dyslipidemia in several ways. Essential hypertension is frequently associated with the several metabolic abnormalities, of which obesity, glucose intolerance, and dyslipidemia are the most common [9].

We found that age >40 years had 3.4 times, BMI (>25 Kg/m^2) had 4.6 times, cholesterol (>200mg/dl) had 1.5 times, hypertension had 2.31 times and diabetes had 5.39 times risk of metabolic syndrome than normal subjects. Chinawale *et al*. [10] included 473 participants who attended free health checkup camps. The MetS was diagnosed as per the definition provided by Joint Interim Statement 2009. The overall prevalence of MetS among studied population was found to be 41.01% (females 44.21% and males 37.91%). Abdominal obesity (66.38%), low high-density lipoprotein-cholesterol (64.69%), and high blood pressure (40.59%) appeared as the most prevalent components. MetS showed a significant association with age, body mass index, total cholesterol, habit of chewing tobacco, and history of hypertension and hyperglycemia.

Brini *et al*. [11] stated that metabolic syndrome is a cluster of risk factors for diabetes and cardiovascular diseases that includes central obesity, hypertension, glucose intolerance, high triglyceride, and low high-density lipoprotein cholesterol. Its prevalence is rapidly increasing worldwide. This study aimed to estimate the prevalence of the metabolic syndrome and associated risk factors in a representative sample of Morocco adults using the 2009 joint interim statement definition. They analyzed data of 820 patients aged 19 years and older. The prevalence of metabolic syndrome is 35.73% among all adults, 18.56% among men, and 40.12% among women. Prevalence increased with age, peaking among those aged 50–59 years. The most common abnormality highlights abdominal obesity (49.15%). Also, half of patients have one or two risk factors for developing this syndrome.

Khan *et al*. [12] found that out of the randomly selected 420 patients (232 males and 188 females), 172 cases (61 males and 111 females) were found to have MeTS. The overall prevalence of MeTS was found to be 40.9% (26.2% of total males and 59% of total females). Among the 172 cases of MeTS, females were more than males (64.5% vs. 35.4%). Maximum numbers of MeTS cases were in the age range of 50–59 years (55/172 = 31.9%) followed by 40–49 years (50/172 = 29%), >60 years (35/172 = 20.3%), 30–39 years (30/172 = 17.4%), and <30 years (2/172 = 1.1%). In the total study population of 420 cases, hyperglycemia was the most common (29.2%) and hyperglycemia, obesity, and high triglyceride were significantly higher prevalence in females. Among the participants of 111 cases of MeTS, hyperglycemia was the most common (71.5%) and high blood pressure, and low highdensity lipoprotein was significantly higher among males.

Conclusion

Authors found that the prevalence of metabolic syndrome and associated risk factors was high among male adults.

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