Prevalence and Risk Factors of Metabolic Syndrome Among Adult Patients in A Tertiary Care Hospital.

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Abstract

Background: MetS a cluster of risk factors, which encompasses visceral obesity, dyslipidemia, hypertension, and insulin resistance, is linked with an increased risk of all causes of morbidity and mortality. In addition, MetS is also associated with a high risk of diabetes and cardiovascular disease. To prevent and control the associated morbidity and mortality, it is essential to identify MetS and predictors clearly among the hospital patients.

Objectives: to find the demographic, clinical, and lifestyle variables that are correlated to the prevalence of the metabolic syndrome in relation to some tertiary hospitals.

Methods: This prospective study was conducted at Department of Medicine, LRH-MTI, Peshawar between june 2019 to june 2021.150 prospective study participants who completed the study (18 and above). Anthropometric, blood pressure, fasting glucose, triglycerides and HDL-C data were taken. The MetS was categorized according to the NCEP ATP III criteria. Statistical analysis and management of data were done using SPSS 24.0. Descriptive statistics were also used and multivariate logistic regression that used the p-value that was less than 0.05 as the standard of significance.

Results: Out of 150 respondents mean age 46.822.5 years, 58 % (n=87) of them are female. 62 respondents are infected with Metabolic Syndrome, which may lead to an overall prevalence of 41.3 %. These were the most common abdominal obesity (68%), high blood pressure (64%), and low HDL-C (59%). The respondents with Metabolic Syndrome were more obese with a fasting glucose of 118.6 plus or minus 24.8mg/dL (p=0.003) and a mean body mass of 29.7 plus or minus 4.2kg/m 2 (p=0.001) whereas their counterparts without Metabolic Syndrome were not. Strongest correlations were observed with female gender, physical inactivity and family history of diabetes ($p<0.05$).

Conclusion: Metabolic syndrome was extremely prevalent among the adult patients who presented to the hospitals particularly the females and the obese people. The leading causes were central obesity, hypertension and dyslipidemia. Lifestyle change is required, periodic screening of MetS elements, and immediate counseling to reduce the rising cardiometabolic burden. The preventive

programs against the modifiable risk factors should also be conducted through tertiary care to minimise the subsequent complications.

Keywords: Metabolic Syndrome; Prevalence; Risk Factors; Adult.

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Introduction:

Metabolic syndrome (MetS) is a collective of metabolic dysfunctions, which exposes individuals to a greater risk of type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD) along with an increased all-cause mortality risk. MetS manifests mostly in central type that includes abdominal obesity, dyslipidemia, hypertension, and hyperglycemia and where all four conditions are at higher risk of triggering adverse cardiometabolic events than each of them alone [1]. Metabolic syndrome (MetS) is a group of metabolic dysfunctions that expose people to greater risks of type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), and an increased risk of all-cause mortality. MetS is principally manifested in its central form, which is abdominal obesity, dyslipidemia, hypertension, and hyperglycemia, which in combination, to a larger degree then any of these conditions alone, subjects the individual to adverse cardio metabolic occurrences [2,3]. The epidemiological processes of the growing prevalence of MetS in developed and developing nations are attestable to the prevalence of obesity and sedentary lifestyles in the world [4]. The diagnosing standards of MetS given by the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) and International Diabetes Federation (IDF) have culturally distinct waist circumference criteria [5]. The cardiometabolic risk of lower body mass indices and waist circumferences is also high in South Asian people compared to the Western people and thus, the ethnicity adjusted cut-offs are necessary. The accelerated urbanization without equivalent growth in physical exercise, and the adoption of bad eating habits has been the leading factor contributing to the increased obesity and insulin resistance in the low and middle-income countries such as Pakistan and the rest of South Asia [6]. In the recent Study, a prevalence of MetS with a shocking 28.4 in adults in Pakistan was found depending on the criteria and population sampled. However, predominance and risk variables of the patient population in these hospitals and the related Managed Care Facilities have yet to be published, particularly as lifestyle linked comorbidities have been congregated. [7]. Earlier blood pressure, glucose, and lipids corrections can be made through early MetS identification in hospital groups through lifestyle pharmacologic changes. Moreover, further identified the risk factors that cluster in our population regarding age, gender, and smoking, dietary, and hereditary factors help us to take a more directed preventive action. Some of the international and local observations described age, obesity, sedentary behavior, and diabetes, as predictors of MetS in the family. [9]. South American population is also very much worried about visceral obesity because MetS can be obtained with a low weight. Notwithstanding this, there is acute deficiency of statistics in the literature on local tertiary hospitals. That is why the current study is devoted to the rate of metabolic syndrome and the complexity of the socio-demographic and clinical risk factors among the patients addressed to the tertiary care hospital. The Study results will guide the knowledge on the burden of MetS in hospitals, and be used to champion the development of institutional screening and prevention initiatives in Pakistan.

Material & Methods

This prospective study was conducted at Department of Medicine, LRH-MTI, Peshawar between june 2019 to june.150 participants, as was their sociodemographic information, medical history, and habits and lifestyles in addition to the questions and the forms prepared. Their height, weight, waist measurements and blood pressure were measured using standardized instruments. One set of the samples was used to determine glucose, triglycerides and cholesterol when the patient had fasted. Based on the requirements of the NCEP ATP III, the components of MetS have been defined as those of central obesity, high trig, low HDL, high BP, or high fasting plasma glucose levels, five out of the five components.

Inclusion Criteria:

The study sample included adults (18 years and above) who attended the outpatient departments, those with a documented informed consent, who were 10 hours fasted, and who had a complete anthropometric and biochemical examination.

Exclusion Criteria:

In order to reduce the number of potential confounding variables in the metabolic testing, the women were not allowed to enter the study when pregnant or acutely ill and they were also not allowed when they are having secondary dyslipidemia, thyroid disease, renal failure, or when they were under pharmacotherapy which alters lipids.

Data Collection:

data collecting and included sociodemographic, medical history and lifestyle information. Standard procedures were employed by certified staff to measure real anthropometric measurements. The blood pressure was taken when the subject was sitting. The internal and external quality inspection of fasting samples that were drawn in the hospital lab was also conducted through rigorous quality control.

Ethical Approval

Ethical Approval was taken in Ethical Approval Board of LRH-MTI, Peshawar which approved the ethical aspects. The participants gave their informed consent. The Study was conducted according to the principles of the Declaration of Helsinki (2013) and the requirements of a country to safeguard the rights of the participants, provide confidence, and engagement on a voluntary basis.

Statistical Analysis

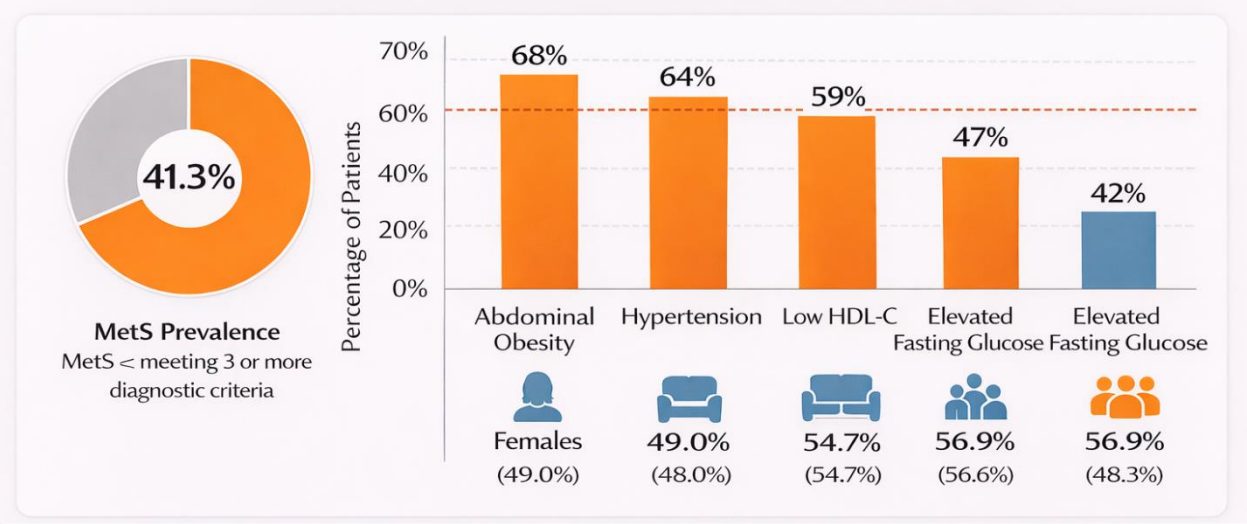
Data were analyzed by use of SPSS version 24.0. Quantitative variables were reported using the means and standard deviations whereas the categorical variables were described using frequency and percentage. The analysis performed the determination of the association of the other variables to MetS using Chi-square and independent t-test. Independent predictors were then identified using logistic regression. The p-value of less than 0.05 was taken to be statistically significant

Results

Prevalence and Risk Factors of Metabolic Syndrome Among Adult Patients in A Tertiary Care Hospital.

A total of 150 adults were examined, Mean age 46.8 years of which 58% were female. Using the NCEP ATP III guidelines, the prevalence of metabolic syndrome (MetS) for the whole cohort was 41.3% (n = 62) with the most frequent conditions being abdominal obesity (68%), hypertension (64%), low HDL-C (59%), hyperglycemia (47%), and hypertriglyceridemia (42%). Compared with individuals without MetS, those with MetS had a significantly higher mean BMI (29.7 4.2 kg/m 2 versus 25.3 3.8 kg/m 2, p = 0.001). Individuals with MetS also had higher mean systolic blood pressure (138/15 mmHg versus 124/13 mmHg, p= 0.002) and mean fasting blood glucose (118.6/24.8 mcg/dl versus 97.2/18.3 mcg/dl, p= 0.003). The prevalence odds of MetS were considerably higher in women (49.0) than in men (32.0) and were significantly associated with physical inactivity (p The most recent model showed that the independent predictors of MetS were obesity (AOR 3.4; 95% CI 1.76–6.8) and hypertension (AOR 2.6; 95% CI 1.3555.3). The last model demonstrated good calibration (Hosmer-Lem indicates p = 0.72), and explained 41% of the variation in the outcomes (Nagelkerke R2 = 0.41).

Fig 1: Prevalence and Diagnostic Components of Metabolic Syndrome in Adult Patients of a Tertiary Care Hospital.



The figure demonstrates that 41.3 percent of adults were in criteria of metabolic syndrome (MetS). The most frequent were abdominal obesity (68%), hypertension (64%), and low HDL-C (59%). MetS was more prevalent in the female population, physical inactive adults and those with family history of diabetes.

Table 1. Baseline Characteristics of Study Participants (n = 150)

Variable	Overall	With MetS	Without MetS	p-value
Age (years, mean ± SD)	46.8 ± 12.5	49.7 ± 11.3	44.7 ± 12.9	0.021
Female gender n (%)	87 (58.0)	43 (69.4)	44 (50.0)	0.040
BMI (kg/m², mean ± SD)	27.2 ± 4.4	29.7 ± 4.2	25.3 ± 3.8	0.001

Waist circumference (cm, mean ± SD)	93.8 ± 10.7	98.1 ± 9.5	90.5 ± 10.2	0.003
Systolic BP (mmHg, mean ± SD)	129 ± 15	138 ± 15	124 ± 13	0.002
Diastolic BP (mmHg, mean ± SD)	84 ± 10	88 ± 9	81 ± 9	0.005
Fasting glucose (mg/dL, mean ± SD)	108.4 ± 23.9	118.6 ± 24.8	97.2 ± 18.3	0.003
Triglycerides (mg/dL, mean ± SD)	164.8 ± 48.5	186.1 ± 52.4	147.6 ± 41.7	0.004
HDL-C (mg/dL, mean ± SD)	42.7 ± 8.9	39.3 ± 8.1	45.2 ± 9.2	0.001
Current smoker n (%)	32 (21.3)	18 (29.0)	14 (15.9)	0.072
Physical inactivity n (%)	64 (42.7)	35 (56.5)	29 (33.0)	0.020
Family history of diabetes n (%)	58 (38.7)	33 (53.2)	25 (28.4)	0.010

Table 2. Prevalence of Metabolic Syndrome and Its Diagnostic Components (NCEP ATP III Criteria)

Component	Definition (Cut-off)	Participants Meeting Criterion n (%)
Central obesity	Waist ≥ 90 cm (men), ≥ 80 cm (women)	102 (68.0)
Elevated triglycerides	≥ 150 mg/dL	63 (42.0)
Low HDL-C	< 40 mg/dL (men), < 50 mg/dL (women)	88 (59.0)
Elevated blood pressure	≥ 130/85 mmHg or on treatment	96 (64.0)
Elevated fasting glucose	≥ 100 mg/dL or diabetes	71 (47.0)
≥ 3 components (MetS present)	—	**62 (41.3)**

Table 3. Distribution of Metabolic Syndrome by Demographic and Clinical Variables

Variable	Categories	MetS Present n (%)	MetS Absent n (%)	p-value
Age group (years)	< 40	13 (26.5)	36 (73.5)	0.040
	40–59	33 (44.0)	42 (56.0)	—
	≥ 60	16 (55.2)	13 (44.8)	—

Gender	Male	19 (31.7)	41 (68.3)	0.040
	Female	43 (49.4)	44 (50.6)	—
BMI category	< 25 (Normal)	7 (16.7)	35 (83.3)	0.001
	25–29.9 (Overweight)	22 (39.3)	34 (60.7)	—
	≥ 30 (Obese)	33 (66.0)	17 (34.0)	—
Physical activity	Active	27 (33.8)	53 (66.2)	0.020
	Inactive	35 (54.7)	29 (45.3)	—
Family history of diabetes	Yes	33 (56.9)	25 (43.1)	0.010
	No	29 (32.2)	61 (67.8)	—

Table 4. Multivariable Logistic Regression Analysis of Factors Associated with Metabolic Syndrome (n = 150)

Predictor Variable	Adjusted Odds Ratio (or)	95% Confidence Interval (CI)	p-value
Age (per 10-year increase)	1.32	1.05 – 1.66	0.018
Female gender	1.79	1.01 – 3.19	0.046
BMI (per kg/m² increase)	1.28	1.11 – 1.47	0.001
Hypertension (yes vs no)	2.63	1.33 – 5.22	0.005
Physical inactivity	2.08	1.08 – 4.00	0.029
Family history of diabetes	2.26	1.13 – 4.50	0.021

Discussion

Finding of our study a single tertiary-care hospital, 41.3 % of adult patients were found to have MetS based on the NCEP ATPIII criteria. based on this, one can assume that the magnitude of cardiometabolic risk in outpatients is high in Pakistan [10]. The out of a hospital cardiometabolic risk described by this author suggests that it is comparable to both the local and global reporting, though the scope of the descriptions remains mostly within 35%-46% and depends on the disaggregation of the definition and diagnostic criteria, sociodemographic characteristics, and lifestyle and behavioral patterns. [11]. As an example, Singh et al. mentioned Indian 38.7 and Hossain et al. 42 to Bangladesh, both using NCEP ATPIII criteria and performing reporting in tertiary care hospitals [12]. These findings, in addition to the reported ones, can also be utilized to

support the argument of the common environmental situation and genetic background of South Asian communities as triggers to the clustering of metabolic syndrome. In this study, as in the case of Rana et al., it was observed that the female participants were much more likely to have MetS [13]. Raza et al. and Nepali Studyers in their analysis also explained the impact of the post-menopausal hormonal changes, the change of an active lifestyle to an inactive lifestyle, and the increase in central adiposity in women as the reason behind these observations [14]. Al-Lawati et al. also reported the greater prevalence of the condition among Omani females and identified the socio-cultural barriers that constrain physical activity among women as a cause of the disparity in the gender metabolic risks. Obesity was the most prospective autonomous variable in the present survey and the possibility of having MetS was nearly three and a half times higher in the obese participants [15]. This finding confirms the hypothesis that visceral adipose tissue forms one of the biggest risk factors of insulin resistance, dyslipidemia, and vascular inflammation [16]. The IDF present definition of MetS brings central obesity to the definition and with the progress in the pathophysiology, wants to capture the explanatory value that central obesity has developed. Indian and Sri Lankan studies refer to high correlations of BMI and waist circumference with the index of insulin resistance [17]. Other recent studies have also shown a close relationship between MetS and hypertension, physical inactivity, and the history of diabetes in the family. Nearly two-thirds of individuals with MetS who have comorbidity of hypertension is associated with the results provided by Mottillo et al. meta-analysis where the authors emphasize the prevalence of hypertension worldwide [18]. The hypertension study and MetS of Basit et al. on urban adults in Pakistan also gave more evidence of the close relationship with hypertriglyceridemia. It has been observed that the diabetes family history is correlated with the importance of genetic predisposition and generalization of the behavioral pattern within a household [19]. The recent population Studyes on Pakistan and its boundaries demonstrated the increasing trends in MetS. An example is a 2020 survey in Khyber Pakhtunkhwa that indicated the astonishing rise of prevalence ten years later, to a high of 47% by the IDF standards [20,21]. These changes can be explained by the change of lifestyle, the habits of urban population which are related to sedentary lifestyles, physical inactivity, and consumption of processed foods. Besides, statistics show that almost a quarter of the adult population of the world is affected by MetS, the highest level of which is observed in the Middle East and South Asia.

Conclusion:

The percentage of metabolic syndrome in this tertiary care was extremely high; the majority of it was attributable to obesity, high blood pressure, and an inactive life among adult patients. Multidisciplinary management, lifestyle modifications, and early diagnosis are key factors which help in reducing cardiometabolic risk. Having regular screening in outpatient clinics, one will be able to identify those who are at risk and avoid the possible complications of cardiovascular disease.

Limitations:

The current study has limitations because cross-sectional studies cannot address the issue of causality. Moreover, it may be necessary to carry out the study in a single tertiary-care hospital, which can reduce the applicability of the results. Respondents may have presented a lifestyle challenge and probably created bias of recollection. Thus, these results are to be verified by and further extended to bigger multicenter longitudinal studies.

Future Recommendations:

Study ought to be conducted on the genetic factors, nutrition, and inflammatory stimuli about metabolic syndrome among South Asians. Preventative strategies including weight control and exercise programs in the community need to be designed, executed, and assessed. It is possible to screen metabolic syndrome at a regular clinic level during the primary and tertiary levels and this will greatly reduce the morbidity of cardiovascular diseases.

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Conflict of Interest: Nil

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Authors Contributions

Concept & Design of Study: **Atta Muhammad Khan**[2]

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Data Collection & Data Analysis: **Zia ullah Khan**[1]

Critical Review: **Zia ullah Khan**[1]

Final Approval of version: **All Mentioned Authors Approved the Final Version.**

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