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Original Article

Frequency of Metabolic Syndrome and Its Components in Family Medicine Department of Military Hospital

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ABSTRACT

Objectives: To determine frequency of metabolic syndrome and its components in patients presenting at the family medicine department of Pak Emirates Military Hospital.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Family Medicine, Pak Emirates Military Hospital (PEMH), Rawalpindi Pakistan, from Jun to Nov 2023.

Methodology: A total of 305 patients who presented at the current family medicine department for their general health checkup were included in the study, based on NCEP: ATP III criteria. All patients were screened for metabolic syndrome (MetS) as well as its individual components. Data was analyzed using SPSS 22:00.

Results: Mean age was 51.90±7.86 years. 43(60.56%) were males, and 28(39.44%) were females. Frequency of Metabolic Syndrome (MetS) was 23(32.39%). Frequency of raised FBG was 29(40.85%), of increased WC was 31(43.66%), of raised BP was 31(43.66%), of low HDL-cholesterol was 25(35.21%), and of raised serum TG was 12(16.90%). In addition, in patients who did not meet the criteria of MetS (n=48), frequency of raised FBG was 6(12.50%) of increased WC was 8(16.66%), of raised BP was 20(41.66%), of low HDL-cholesterol was 2(4.16%) and of raised serum TG was 6(12.50%).

Conclusion: Metabolic syndrome (MetS) was found in 32.39% of the population, which is alarmingly high.

Keywords: Cardiovascular Disease, Insulin Resistance, Metabolic Syndrome, Obesity.

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INTRODUCTION

There is an increasing number of researchers interested in a collection of interrelated risk factors for cardiovascular disease known collectively called as metabolic syndrome (MetS).[1,2] It is possible that there is a connection between metabolic syndrome and the risk of coronary heart disease in older adults, because both the incidence rate of coronary heart disease and the frequency of metabolic syndrome demonstrate an increased trend as individuals age. The metabolic syndrome is characterized by several key components, namely elevated levels of blood glucose, central obesity, increased levels of lipids, hypertension, and decreased levels of high-density lipoprotein lipids (HDL).[3] Because of urbanization, high-calorie consumption, increasing numbers of obese people, and a lack of physical activity, metabolic syndrome (MetS) has become a serious medical and public-health issue around the world. Metabolic syndrome (MetS) has a significant role as a concurrent risk factor for the development of coronary artery disease (CAD). It has been found that individuals with metabolic syndrome (MetS) experience higher chance of developing stroke or heart disease, along with a significant rise in deaths from cardiovascular disease (CVD).[4,5]

It has been observed that individual components of metabolic syndrome (MetS) exist in apparently healthy looking individuals which generally appears as a harmless occurrence but, due to strong association of MetS with CVD, it has the potential implication on individual as well as public health.[6] When it comes to frequency of metabolic syndrome (MetS) globally, it has been observed that in different populations of the world, it varies. Similar is the case in Pakistan, where various studies previously conducted have reported variation regarding the frequency of metabolic syndrome (MetS) in Pakistani population residing in different provinces of Pakistan. In Pakistan, its frequency was reported at 28.8%, in Punjab 68%, in population of urban Sindh it was 54.9%, and in Balochistan 59.9%.[7,8]

Metabolic syndrome (MetS) is widely recognized as the main contributory factor for atherothrombotic morbidities, and as such, its existence or absence

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should be treated as a warning sign of sustained vulnerability to develop cardiovascular disease (CVD). In addition, its presence in healthy individuals has the potential to lead to underdiagnosis of this potentially life-threatening morbidity. Furthermore, there is a great degree of variability that exists regarding the frequency of metabolic syndrome and its components in present population. Therefore, this study was conducted with the focus on determining the frequency of metabolic syndrome and its components in patients who presented to us at present institutional department of family medicine.

METHODOLOGY

This cross-sectional study was conducted at Pak Emirates Military Hospital, Rawalpindi, Pakistan, from Jun to Nov 2023 after obtaining approval from the ethical review board of Pak Emirates Military Hospital (PEMH), Rawalpindi (ERB #: A/28/ERC/606/23, 21-05-2023). Sample size of 305 was calculated using the WHO sample size calculator by assuming a confidence level of 95%, absolute precision of 4.8%, and an anticipated frequency of metabolic syndrome of 76%.[9]

Inclusion Criteria: Adult patients aged 18 years or older, who were either male or female, who presented at family medicine department for their general health checkup were included in the study.

Exclusion Criteria: Patients who had previously diagnosed metabolic syndrome (MetS), who had previously diagnosed diabetes (HbA1C% ≥6.5%),[10] previously diagnosed hypertension (persistently raised BP ≥130/80),[11] who were mentally incapacitated to consent and communicate for participation in the study, or who were already using anti-diabetic, anti-hypertensive, and anti-obesity medication were excluded from the study.

Study population was selected by using a non-probability consecutive sampling technique. A written consent, which was signed by the study participants, was made an essential prerequisite. Once selected, the patient's age (in years), gender, area of residence, and smoking history were documented. Once included all the patients were assessed for the presence of metabolic syndrome (MetS) as well as its individual components. Diagnosis of Metabolic syndrome (MetS) was based on National Cholesterol Education Program Adult Treatment Panel III (NCEP:ATPIII) criteria,[12] which is tabulated below in Table-I.

Data was analyzed by using Statistical Package for Social Sciences (SPSS) 22.00. Quantitative data (age, FBG, WC, HDL and TG) was represented using Mean±SD. Qualitative data (gender, area of residence, smoking history, presence of MetS and its components) was represented by using percentage and frequency. Frequency of metabolic syndrome was stratified by age, gender, area of residence and smoking history. Post-stratification, Chi square test was used by keeping a *p*-value of ≤0.05 considered as statistically significant.

Table-I: National Cholesterol Education Program Adult Treatment Panel III (NCEP:ATPIII) criteria to diagnose Metabolic Syndrome (MetS)

Presence of ≥ 3 of following parameters = MetS
Raised (FBG) fasting blood glucose (≥ 110 mg/dl) – single reading, assessed sending a 3ml blood sample to the laboratory
Increased (WC) waist circumference (> 102 cm in men; > 88 cm in women) – measured by using a measuring tape taking iliac spine as a reference point
Raised (BP) blood pressure (≥ 130/85 mmHg) – taken twice one present apart using a sphygmomanometer
Low HDL-cholesterol (< 40 mg/dl in men and < 50 mg/dl in women) – assessed sending a 3ml blood sample to the laboratory
Raised serum (TG) triglycerides (≥ 150 mg/dl) – assessed sending a 3ml blood sample to the laboratory

RESULTS

A total of 305 patients were included in this study to be screened for presence of metabolic syndrome (MetS) and its components. Mean age of study population was 51.08±7.76 years. 135(44.26%) patients were aged ≤50 years while 170(55.74%) were aged >50 years. There were 185(60.66%) male participants while remaining 120(39.44%) participants were female. 168(55.08%) participants were from urban locality while 137(44.92%) belonged to rural areas. 111(36.39%) of study participants were smokers while 194(63.61%) were non-smokers. Frequency of Metabolic Syndrome (MetS) population was 97(31.80%), as depicted below in figure-1.

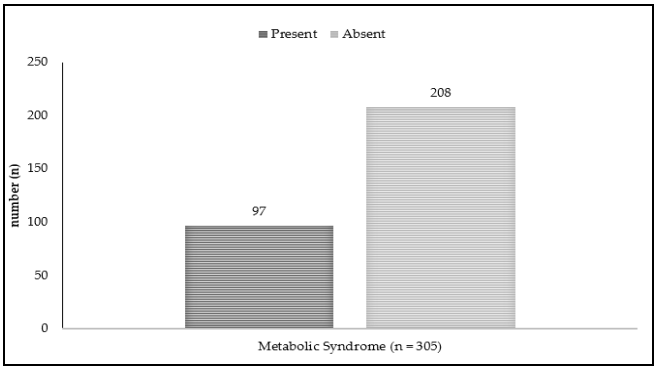

Figure-1: Frequency of MetS in Study Population (n=305)

In terms of frequency of components of metabolic syndrome in whole population (with as well as without MetS) – (n=305), we found that frequency of raised FBG was 122(40.00%) with a mean FBG level of 97.11±22.82mg/dl. Frequency of increased WC was 133(43.61%) with a mean WC of 96.00±17.72cm in males and 89.45±14.53cm in women. Frequency of raised BP was 135(44.26%). Frequency of low HDL-cholesterol was 109(35.74%), with a mean HDL level of 50.23±10.35mg/dl in men and 49.35±10.07mg/dl in women. Frequency of raised serum TG was 50(16.39%) with a mean TG level of 130.05±21.94mg/dl in men and 128.83±20.66mg/dl in women. Frequency of these components of MetS is depicted below in figure-2.

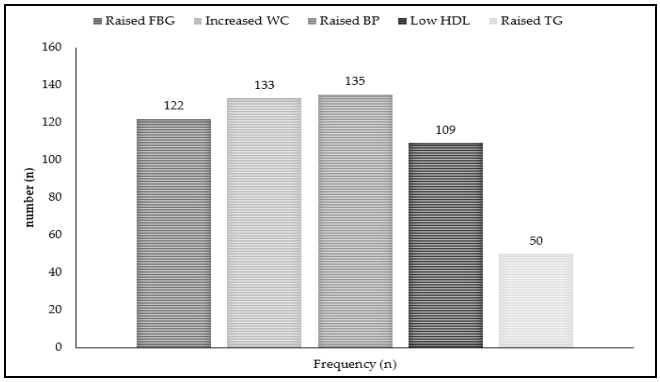

Figure-2: Frequency of Components of MetS (n=305)

In addition, it was also found that some of the components of MetS were also present in patients who did not meet the criteria of MetS (n=208) amongst which frequency of raised FBG was 25(12.02%) of increased WC was 41(19.71%), of raised BP was 90(43.27%), of low HDL-cholesterol was 16(7.69%) and of raised serum TG was 25(12.02%).

Distribution of frequency of metabolic syndrome (MetS) across age groups, gender, area of residence, and smoking history is given below in table-II.

DISCUSSION

In present study National Cholesterol Education Program Adult Treatment Panel III (NCEP: ATPIII) criteria were used to find the frequency of metabolic syndrome, as well as its components and the findings of the study were alarmingly very high. Literature has already highlighted that Metabolic syndrome (MetS) is becoming increasingly prevalent everywhere, in both emerging economies and industrialized nations.[13,14] It is a multifaceted condition characterized by a significant social and economic burden and is widely recognized as a global epidemic.[15,16] There are several criteria that have been proposed over time that have been utilized to make the diagnosis of metabolic syndrome (MetS). These include World Health Organization (WHO) criteria, European Group for the Study of Insulin Resistance (EGIR) criteria, National Cholesterol Education Program Adult Treatment Panel III (NCEP: ATPIII) criteria, American Association of Clinical Endocrinology criteria, International Diabetes Federation (IDF) criteria and American Heart Association/National Heart, Lung, and Blood Institute (AHA/NHLBI) criteria.[17]

Table-II: Frequency of Metabolic Syndrome (Mets) by Age Groups, Gender, Area of Residence, and Smoking History Strata (n=305)

Age Stratification			
Metabolic syndrome	≤50 years (n=135)	>50 years (n=170)	***p*-value**
Yes No	38(28.15%) 97(71.85%)	59(34.71%) 111(65.29%)	0.222
Gender Stratification			
Metabolic syndrome	Male (n=185)	Female (n=120)	***p*-value**
Yes No	61(32.97%) 124(67.03%)	36(30.00%) 84(70.00%)	0.586
Stratification by Area of Residence			
Metabolic syndrome	Urban (n=168)	Rural (n=137)	***p*-value**
Yes No	61(36.31%) 107(63.69%)	36(26.28%) 101(73.72%)	0.061
Stratification by Smoking Status			
Metabolic syndrome	Smoker (n=111)	Non-smoker (n=194)	***p*-value**
Yes No	67(60.36%) 44(39.64%)	30(15.46%) 164(84.54%)	<0.001

However, the current study findings lie within the range found in a study conducted by Basit *et al.*, in Pakistani population, which reported the frequency of MetS to be between 18-46%.[18] This was much higher compared to the frequency reported in another similar study conducted by Ferguson *et al.*, who reported a very low frequency of metabolic syndrome at only 1.2%.[19] Furthermore, a study by Adil *et al.*, reported that the frequency of MetS was 28.8%, which was closer to the frequency reported in present study.[7] On the other hand, studies conducted by Vatakencherry *et al.*, and Osei-Yeboah *et al.*, reported much higher frequency of metabolic syndrome as compared to what has been found in this study at 76% and 43.83%.[9,20] It was also found that even in patients who did not meet the criteria of metabolic syndrome, its components did occur amongst which raised BP was the most commonly encountered component. This is congruent with what has been reported by Sang *et al.*, who found that components of metabolic syndrome

can also exist in patients who are apparently completely healthy.[6] Upon stratification of frequency of MetS by age group, it was observed that although the frequency was higher in the older age group, age did not have a significant effect on the frequency of MetS. This higher frequency in older age corresponds with the findings of the study conducted by Vasquez *et al.*, that with advancing age, basal metabolic rate (BMR) decreases, thus increasing the risk of developing MetS.[21] In Gender stratification, it was observed that there was no statistically significant difference between genders in terms of frequency of MetS, which was not consistent with the findings of a study conducted by Alipour *et al.*, who reported that female gender decreased the risk of developing MetS.[22] Locality in which the screened population of present study resided was also found to have no statistically significant impact on the frequency of MetS. This finding was opposite to the findings of a study conducted by Sundarakumar *et al.*, in which they found significantly higher MetS frequency in urban population.[23] In addition, smoking had a statistically significant impact on the frequency of MetS in population of present study. This finding is backed by the observation of a study conducted by Kim *et al.*, in which it was reported that smoking increases the chances of developing MetS by 2.4 times.[24]

Owing to these findings, it is evident that not only is the MetS common in population of this study, but the frequency of its components is also quite high in individuals who do not meet the criteria of metabolic syndrome. Because of this, metabolic syndrome (MetS) is a serious public health problem, and we strongly recommend that a comprehensive study on a nationwide scale should be carried out to identify the frequency of this dangerous condition in present nation.

CONCLUSION

Metabolic syndrome (MetS) as well as its components are highly prevalent in present local population. Older age, male gender, urban area of residence have no significant impact on frequency of MetS while smoking has major impact on the frequency of MetS. This is a major health concern and large scale study at national level is need of the present to determine the burden of this high risk condition in present country.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AN & SN: Data acquisition, data analysis, critical review, approval of the final version to be published.

NFM & HMU: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

HT & WUR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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