Frequency of Metabolic Syndrome among Patients who Sustained Acute Myocardial Infarction.

Atif Ahsan[1], Sajjad Ali[1], Sher Bahadur Khan[2], Sanjay Gandhi[3]

ABSTRACT

Background: Metabolic syndrome is a constellation of various cardiovascular risk factors. Patients having Metabolic syndrome in association with ischemic heart disease tend to have more comorbidities and worse hospital course. Diabetes mellitus and other components of Metabolic syndrome adversely affects the microcirculation, myocardium, enlarges infarct size and patients are more prone to cardiac failure in those presenting with acute coronary event.

Objective: To assess the frequency of metabolic syndrome among patients who sustained acute myocardial infarction without prior history of acute coronary events.

Marerial and Methods: This was a crossectional descriptive study, conducted after ethical approval from institutional research board and ethical committee, at cardiology department of Qazi Hussain Ahmad medical complex Nowshera from 5th August 2020 to 20th March 2021. Patients presenting with 1st ever episode of acute myocardial infarction were recruited into the study. NCEP-ATP‡V criteria was used to diagnose metabolic syndrome. 195 patients were recruited into the present study using WHO sample size calculator. Data analysis was done using SPSS version22.

Results: Among 195 patients with acute MI, 58.5% (n=114) had metabolic syndrome. Frequency of metabolic syndrome increased with increasing age (57.8% vs 31.5% vs 10.5%; p=0.043). There was a significantly increased prevalence of hypertension (32.5% vs 67.5%; p=0.017), diabetes (35.9% vs 64.1%; p=0.027), elevated plasma triglycerides (30.7% vs 69.3%; p=0.047), low HDL cholesterol (36.8% vs 63.2%; p=0.003) and abdominal obesity (28.9% vs 71.1%; p=0.001) among the group of acute MI patients with metabolic syndrome as compared to those who had no metabolic syndrome. The difference in the frequency of MetS among male and females (59.6% vs 41.4%; p=0.56) was statistically insignificant.

Conclusion: Among patients who had sustained acute MI, 58.5% (n=114) patients were found to have Metabolic Syndrome.

Key Words: Abdominal obesity, myocardial infarction, coronary artery disease.

This article may be cited as: Ahsan A, Ali S, Khan SB, Gandhi S. Frequency of Metabolic Syndrome among Patients who Sustained Acute Myocardial Infarction. J Saidu Med Coll Swat 2022;12(2):57-61.DOI:https://doi.org/10.52206/jsmc.2022.12.2.555

INTRODUCTION

Metabolic syndrome (MetS) is a constellation of various cardiovascular risk factors like hyperglycemia, elevated blood pressure, lipid abnormalities, insulin resistance and visceral obesity.[1] It has been defined with slight variations by various international bodies like W.H.O, national cholesterol education program and adult treatment panel III (NCEP ATP III)[2] and international diabetes federation (IDF).[3,4]

MetS may occur as a consequence of a complex interplay of various environmental and hereditary factors and increasingly affects younger and adolescent population and hence leads to premature coronary artery disease with increasing frequency.[5] On the other hand patients having MetS in association with ischemic heart disease tend to have more comorbidities and worse hospital course as compared those without MetS, which in part is due to the prothrombotic and proinflammatory response associated with MetS.[6-8]

Various Studies have shown that patients who suffer from MetS have tend to have more severe coronary artery disease and suffer more from stent related complications like thrombosis, stenosis and other major adverse cardiac events, compared to the general population.[9-11] Diabetes mellitus and other components of MetS adversely affects the microcirculation, myocardium, enlarges infarct size and patients are more prone to cardiac failure in those presenting with acute coronary event, making it imperative to take extra care of the patients with diabetes mellitus and other components of metabolic syndrome.[12-14]

Unfortunately the occurrence of metabolic syndrome is on the rise globally affecting almost 25% of the adult population.[15,16] It increasingly affects those with younger age and adolescents, according to one study it affected 26.8% of the patients with age less than 40years with CAD.[6] This trend is due in part to the life style and changing dietary patterns and people becoming more and more sedentary. This has led to an increasing burden of coronary artery diseases and other complications of the components of MetS.[17] According to a systematic review in 2018, prevalence of MetS was 26.1 % (NCEP ATPIII) in south Asia. Among the South Asian countries

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Received: May 06th, 2021 Accepted: April 08th, 2022

Pakistan has highest prevalence i.e. 31% as per NCEP ATP III.[18] The prevalence of MetS is even higher in patients with underlying ischemic heart disease than the general population and ranges from 45% to 78%.[2,20-22]

Cardiovascular diseases are a serious problem and growing burden, affecting 17.5% of the Pakistani population. Cardio-metabolic risk factors, adverse life styles and dietary patterns are reasons partly.[22]Given the increasing incidence of MetS and consequently the higher burden of Cardiovascular diseases across the globe in general and Pakistan in particular, it is imperative that MetS and its component factors are identified and treated early in order to decrease the incidence of Cardiovascular diseases and its complications.[19] Those patients who are already having cardiovascular diseases are particularly prone to all kind of complications[24,26].

In our local setup data regarding the presence of Mets in patients with underlying ischemic heart disease is sparse. This study was conducted with aim to provide fresh data regarding Mets among patients who have suffered first episode of myocardial infarction, so that further strategies could be formulated to prevent cardiovascular diseases by early identification and treatment of MetS and its components.

MATERIAL AND METHODS

This was a crossectional descriptive study performed at the department of cardiology, Qazi Hussain Ahmad medical complex and teaching hospital Nowshera. After approval from the institutional research board and ethical committee this Study was conducted from 5th August 2020 to 20th March 2021. Sample size was calculated using W.H.O sample size software. Taking MetS as prevalent in 76% patients in acute coronary events , 95% confidence interval and 6% margin of error, 195 patients were recruited into the this study. After fully discussing the purpose and process of the study an informed written permission was taken from the patients.

Patients presenting to emergency room with 1st episode of acute myocardial infarction, including both genders were included into the study. Patients with renal failure, liver failure, nephrotic syndrome, ascites due to any reason, Cushing syndrome, polycystic ovarian syndrome and patients with previous history of MI and CAD were excluded from the study.

MetS diagnosis was based on NCEP ATP III criteria as 3 out of 5 of the following components; 1) Waist circumference = 102cm and =88cm in males and females respectively, 2) Plasma triglycerides = 150mg/dl, 3) HDL cholesterol =40mg/dl and =50mg/dl in males and females respectively, 4) BP =130/85, 5) fasting blood sugars = 110mg/dl.

Waist circumference (WC) was measured at the level of iliac crest, patients' fasting blood samples were taken for plasma cholesterol and blood sugar and sent to the hospital laboratory to be analyzed by an expert pathologist. Blood pressure was measured with patients resting for at least 5 minutes before examination as per AHA guidelines protocol. Standard mercury sphygmomanometer was used for measuring the blood pressure.

ST-elevation myocardial infarction diagnosis was based on following features;

1. Characteristic retrosternal chest pain, discomfort or tightness radiating to left arm, jaw and/or shoulder.
2. ECG changes showing ST elevation =1mm in chest leads or =2mm in limb leads.

Non ST-elevation myocardial infarction diagnosis was based on following features;

1. Characteristic retrosternal chest pain, discomfort, tightness radiating to left arm, jaw and/or shoulder.
2. Normal ECG or ECG changes inconsistent with ST-elevation MI.
3. Elevated cardiac biomarkers (troponin T >0.1ng/dl, troponin I: >0.03 ng/mL)

To avoid confounders patients' blood and urine samples were taken and sent to lab to rule out renal, liver failure, nephrotic syndrome, pregnancy and polycystic ovarian syndrome, which may lead to bias in the study results.

Data was analyzed using SPSS version 22. Data transformation was performed and new variable were computed where desirable (i.e. age categories and gender etc.). Descriptive statistics were performed and qualitative variables like gender, family history and MetS frequency etc were presented as frequency and percentages. Comparison of the frequency of qualitative variables like smoking status, family history, gender, age categories, FBS, triglyceride

cholesterol, HDL cholesterol among acute MI patients with and without MetS was done using chi squared test. p value =0.05 significant was considered significant.

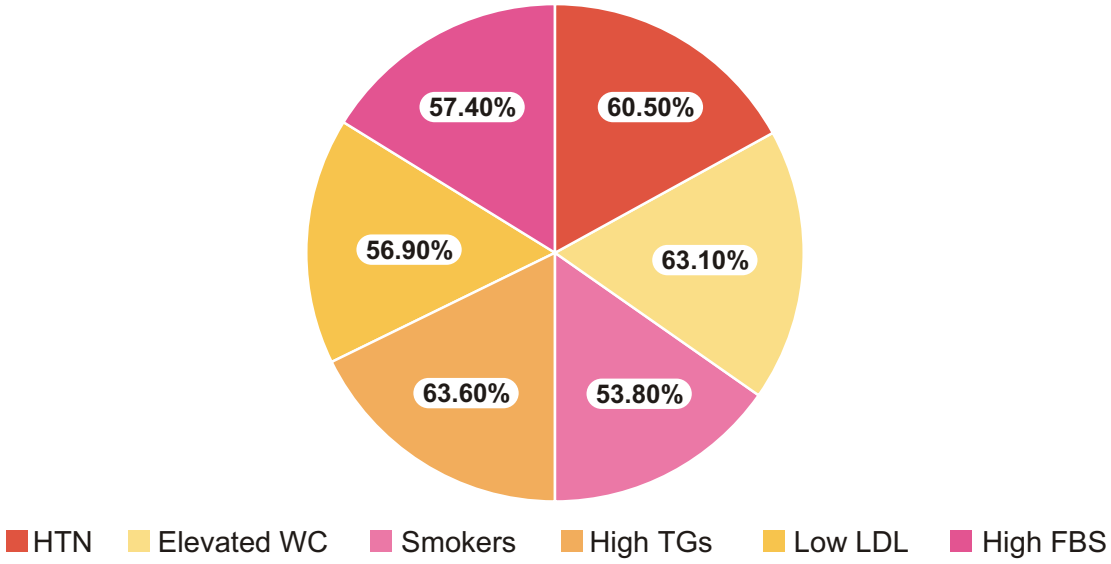
RESULTS

A total of 195 patients were recruited into the present study. Metabolic syndrome was noted to be present in 114(58.4%) patients, while 81(41.6%) didn't have MetS. The prevalence of hypertension, abdominal obesity (as shown by increased WC), Smoking, high plasma TG, low HDL cholesterol and diabetes was 60.5% (n=118), 53.8% (n=105), 63.6% (n=124), 56.9% (n=111), 57.4% (n=112) respectively. There was statistically increased prevalence of hypertension(32.5% vs 67.5%; p=0.017), diabtetes(35.9% vs 64.1%; p=0.027), elevated TG cholesterol(30.7% vs 69.3%; p=0.047), low HDL cholesterol(36.8% vs 63.2%; p=0.003), family history of CAD (72.8% vs 27.2%; p=0.003) and abdominal obesity(28.9% vs 71.1%; p=0.001) in MetS group as compared to the group of acute MI patients without MetS.

The frequency of MetS increased significantly among the group of patients with older age (57.8% vs 31.5% vs 10.5%; p=0.043), but didn't differ significantly (59.6% vs 41.4%; p=0.56) among males and females. The frequency of smoking didn't differ significantly among patients with and without MetS (53.5% vs 46.5%; p=0.91).

Table 1. Frequency of Various Cardiac Risk Factors in Acute Myocardial Infarction

S.No.	Variables	Frequency	Percentages
1	Hypertension.	118	60.5%
2	Elevated WC.	123	63.1%
3	Smoking status	105	53.8%
4	Elevated Plasma triglycerides.	124	63.6%
5	Low HDL	111	56.9%
6	High fasting blood sugar	112	57.4%



Frequency of Cardiac Risk Factors Among Patients with Acute MI

DISCUSSION

A total of 195 patients were recruited in the present study. MetS was found to be present in 58.4% of the patients. According to a systemic review published in 2018 the prevalence of MetS was found to be 31% in Pakistan which is the highest among the south Asian ethnicity.[18] The prevalence world is 20 to 25 % in the general population,[1] It's Prevalence in CAD ranges from 45 to 78%.[20-22]

In one study, based on NCEP ATP III the frequency of MetS was found to be 45.9%,[21] and 60% among patients with IHD, affecting elderly population and female gender with increasing frequency and had strong correlation with increasing severity of CAD.[27]

Another study reported its prevalence around 60% among CAD patients, females were found to be affected more as compared to males (51.2% vs. 21.9%; p = 0.001).[19] In a similar study 54.9% males and 78.7% females were found to have MetS (p ? 0.001). Females were shown to have increased waist circumference and hence increased prevalence of abdominal obesity and consequently suffered more from MetS as compared to males[2] .Our study showed equal prevalence of MetSs among males and females. These variations could in part be due to variations in the level of physical activity, dietary patterns, and genetic predisposition among different communities.

MetS increasingly affects the young adults, consequently there is an increasing prevalence of premature atherosclerotic cardiovascular diseases and its complications. A similar study reported that 28% of CAD patients younger than 40 years had metabolic syndrome, Dyslipidemia and smoking were shown to be the primary targets of intervention in these patients.[5]This trend in the prevalence of MetS among younger age group is partly due to increasingly sedentary life style and unhealthy dietary patterns.

In another study conducted on chronic CAD patients almost one out of two patients(47%) had MetS, in patients who had four or five components of metabolic syndrome had increased odds of having severe and extensive CAD,[20]where as prevalence of MetS in our study is 58.5%, these differences may be due in part to differences in level of physical actitvity, prevalence of DM, HTN and lipids disorders.

In our study the group of acute MI patients who had MetS had higher prevalence of diabetes, hypertension, dyslipidemia and abdominal obesity compared to the acute MI patients who had no MetS , the difference in prevalence of MetS among males and females was statistically insignificant (59.6%vs 40.4% ; p=0.58). Metabolic syndrome was prevalent more in the elderly as compared to the younger age groups. This increasing burden of MetS and its component factors could be due to increasingly sedentary life style, lack of healthy dietary pattern, increasing use of fast foods.[16]

LIMITATIONS

There are certain limitations we noted to the present study namely 1) sample size was small, 2) not integrating other criteria in our study i.e WHO and IDF criteria for the diagnosis of MetS. Large sample size, multi centre studies and integrating other criteria to diagnose MetS would increase the validity and generalizability of the present study.

CONCLUSION

Metabolic Syndrome is the predominant risk factor in Patients presenting with Metabolic Syndrome .

RECCOMENDATION

Given the attendant risk of increased morbidity and mortality in these patients particular, it is imperative that all patients who sustained acute MI, be screened early for the components of metabolic syndrome and treated promptly.

REFERENCES

1. Alberti KG, Zimmet P, Shaw J. The metabolic syndromea new worldwide definition. The Lancet. 2005 Sep 24;366(9491):1059-62.
2. Ashraf T, Memon MA, Talpur MS, Panhwar Z, Rasool SI. Frequency of metabolic syndrome in patients with ischaemic heart disease. Journal of the Pakistan Medical Association. 2011 Aug 1;61 (8): 729-38.
3. Alberti KG. International diabetes federation task force on epidemiology and prevention; national heart, lung, and blood institute; American heart association; world heart federation; international atherosclerosis society; international association for the study of obesity: harmonizing the metabolic syndrome: a joint interim statement of the international diabetes federation task force on epidemiology and prevention; national heart, lung, and blood institute; American heart association; world heart federation. IMCirculation.2009;120: 1640-5
4. Kaur J. A comprehensive review on metabolic syndrome. Cardiology research and practice. 2014 Oct;2014.
5. Kemaloğlu Öz T, Çakmak N, Özpamuk Karadeniz F, Zengin A, Öz A, Altay S, Çınar T, Yılmaz H, Akyüz Ş, Gürkan K. Prevalence of Metabolic Syndrome in Young Patients with ST Elevation Myocardial Infarction and Association of Coronary Artery Lesions.JACC.2013 Oct 29;62(18S2):C117-8.
6. Aggarwal A, Aggarwal S, Sharma V. Metabolic syndrome and coronary artery disease in Indians younger than 40 years. Journal of Endocrinology and Metabolism. 2012;2(1):39-45.
7. Ribeiro C, Ferreira R. Revista Portuguesa de Cardiologia. Quality and prestige for the use of cardiovascular medicine. Revista portuguesa de cardiologia: orgao oficial da Sociedade Portuguesa

de Cardiologia= Portuguese journal of cardiology: an official journal of the Portuguese Society of Cardiology. 1992 Jan;11(1):11-2.
8. Madrid-Miller A, Ruiz AA, Sánchez GB, Gutiérrez EA, Guzmán RV, Aguilar RJ. Metabolic syndrome: clinical and angiographic impact on patients with acute coronary syndrome. Cirugia y Cirujanos. 2010 Mar 1;78(2):113-20.
9. Wu ZK, Wang JJ, Wang T, Zhu SS, Chen XL, Liu C, Zhang WG. Clopidogrel resistance response in patients with coronary artery disease and metabolic syndrome: the role of hyperglycemia and obesity. Journal of Geriatric Cardiology: JGC. 2015 Jul;12(4):378-86.
10. Lee SH, Jeong MH, Kim JH, Kim MC, Sim DS, Hong YJ, et al. Influence of obesity and metabolic syndrome on clinical outcomes of ST-segment elevation myocardial infarction in men undergoing primary percutaneous coronary intervention. Journal of Cardiology. 2018 Oct 1;72(4):328-34.
11. Campbell DJ, Somaratne JB, Jenkins AJ, Prior DL, Yii M, Kenny JF, et al. Impact of type 2 diabetes and the metabolic syndrome on myocardial structure and microvasculature of men with coronary artery disease. Cardiovascular Diabetology. 2011 Dec;10(1):1-4.
12. Yazici HU, Poyraz F, Turfan M, Sen N, Tavil Y, Tulmac M, et al. The prevalence of the metabolic syndrome and its impact on the left ventricular systolic function in the patients with non-diabetic first ST elevation myocardial infarction. Eur Rev Med Pharmacol Sci. 2012 Jan 1;16(1):90-5.
13. Clavijo LC, Pinto TL, Kuchulakanti PK, Torguson R, Chu WW, Satler LF, et al. Metabolic syndrome in patients with acute myocardial infarction is associated with increased infarct size and in-hospital complications. Cardiovascular Revascularization Medicine. 2006 Jan 1;7(1):7-11.
14. Timóteo AT, Carmo MM, Ferreira RC. Does metabolic syndrome predict significant angiographic coronary artery disease?. Revista Portuguesa de Cardiologia. 2012 Dec 1;31(12): 769-78.
15. Bhalwar R. Metabolic syndrome: The Indian public health perspective. medical journal armed forces india. 2020 Jan 1;76(1):8-16.
16. Malik MS, Qayyum W, Farooq A, Waqas A, Sukhera AB, Khalid MA, et al. Dietary patterns, exercise, and the metabolic syndrome among young people in Urban Pakistan (Lahore). Metabolic Syndrome and Related Disorders. 2020 Feb 1;18(1):56-64.
17. Misra A, Soares MJ, Mohan V, Anoop S, Abhishek V, Vaidya R, et al. Body fat, metabolic syndrome and hyperglycemia in South Asians. Journal of diabetes and its complications. 2018 Nov 1;32(11):1068-75.
18. Jalil A, Ishaq Z, Khan WS, Akram U. Frequency of Metabolic Syndrome in Patients with Ischemic Heart Disease Presenting to a Tertiary Care Hospital of Lahore. PAKISTAN JOURNAL OF MEDICAL & HEALTH SCIENCES. 2017 Jul 1;11(3):956-8.
19. Varounis C, Rallidis LS, Franco OH, Lekakis J. Prevalence of metabolic syndrome and association with burden of atherosclerotic disease in patients with stable coronary artery disease. Current Medical Research and Opinion. 2016 Jun 2;32(6):1175-81.
20. Pradeepa R, Surendar J, Indulekha K, Chella S, Anjana RM, Mohan V. Prevalence of Metabolic Syndrome and its Association with Coronary Artery Disease Among an Urban Elderly South Indian Population (CURES-145). The Journal of the Association of Physicians of India. 2016 May 1;64(5):20-5.
21. Zubair F, Nawaz SK, Nawaz A, Nangyal H, Amjad N, Khan MS. Prevalence of cardiovascular diseases in Punjab, Pakistan: a cross-sectional study. Journal of Public Health. 2018 Oct;26(5):523-9.
22. Malik S, Zhao Y, Budoff M, Nasir K, Blumenthal RS, Bertoni AG, et al. Coronary artery calcium score for long-term risk classification in individuals with type 2 diabetes and metabolic syndrome from the multi-ethnic study of atherosclerosis. JAMA cardiology. 2017 Dec 1;2(12):1332-40.
23. Kul S, Uyarel H, Gul M, Kucukdagli OT, Bacaksiz A, Erdogan E, et al. Metabolic syndrome and long-term cardiovascular outcomes in NSTEMI with unstable angina. Nutrition, Metabolism and Cardiovascular Diseases. 2014 Feb 1;24(2):176-82.
24. Rochlani Y, Pothineni NV, Kovelamudi S, Mehta JL. Metabolic syndrome: pathophysiology, management, and modulation by natural compounds. Therapeutic advances in cardiovascular disease. 2017 Aug;11(8):215-25.
25. Maqsood J, Ghafoor A, Safdar T. Frequency of metabolic syndrome and associated mortality in newly diagnosed acute ischemic cardiac patients. Isra Med J 2017;9(1):24-8.
26. Khan A, Saif M, Naqvi SN, Samad MA, Rasheed SZ, Ishaq M. Prevalence and predictors of metabolic syndrome in patients with coronary artery disease. Pakistan Heart Journal. 2018;51(4).

DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTEREST: Authors declared no conflict of interest.
GRANTED SUPPORT AND FINANCIAL DISCLOSURE: Nil

AUTHOR'S CONTRIBUTION
The following authors full fill authorship criteria as per ICMJE guidelines;

Ahsan A:	Idea conception, drafting the work, final approval, agreed to be accountable for all the work.
Ali S:	Design of the work, data acquisition, critical rivision, final approval, agreed to be accountable for all the work.
Khan SB:	Data analysis, drafting of the work, final approval, agreed to be accountable for all the work.
Gandhi S:	Data interpretation, critical revision, final approval, agreed to be accountable for all the work.