

Prevalence of Metabolic Syndrome in Young Patients with Acute ST-Elevation Myocardial Infarction (STEMI)

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ABSTRACT

Background: The metabolic syndrome is linked to several conventional and rising pro-thrombotic and pro-inflammatory cardiac risks. Most patients with cardiovascular disease have metabolic syndrome; however, the occurrence and connection of its various elements aren't obvious. There isn't any research regarding the occurrence of Metabolic Syndrome in young patients with acute STEMI.

Objective: The purpose of this study was to figure out the occurrence of metabolic syndrome (MS) in young patients shown ST-Elevation Myocardial Infarction (STEMI) at a tertiary care hospital in Karachi, Pakistan.

Material and Methods: The research was conducted on 170 patients with STEMI. Body mass index was measured. Smoking level, metabolic syndrome (MS), and aspects of the metabolic syndrome (BMI >23 kg meter per square, high blood pressure, hypertriglyceridemia, low-plasma HDLc, and affected fasting plasma glucose) were noted. Descriptive statistics were used, and stratification was done in the study. Fisher exact test and post-stratification by square test were used during the research study. P-value ≤0.05 was regarded as significant.

Results: There were 42.2% women and 57.6% men with a mean age of 29.84±7.96 years. Metabolic syndrome (MS) was positive in 64.7 per cent of sufferers. BMI >23 kg meter per square was noticed in 97.1 per cent of patients. High blood pressure in 72.4 per cent of patients. Hypertriglyceridemia in 77.65 per cent of patients, Low plasma HDLc in 44.1 per cent of individuals, and affected fasting plasma glucose in 47.1 per cent of patients.

Conclusion: It had been determined by research findings that the occurrence of metabolic syndrome in young patients having STEMI was higher. The common element was BMI >23 kg/m², Hypertension, and Hypertriglyceridemia.

Keywords: Prevalence, Young Patients, Metabolic Syndrome (MS), STEMI, Aspects of MS

INTRODUCTION

Metabolic syndrome (MS) is a serious health condition of this age. The occurrence of MS in the human population is rising. The metabolic syndrome means a group of hazardous heart attack risks: diabetic issues and elevated fasting plasma glucose, central obesity and truncal obesity, high cholesterol and hypertension¹.

Metabolic syndrome (MS) is among this century's serious public health problems. It's a constellation of bodily pains and metabolic issues, commonly occurring collectively. If the present trend proceeds, these problems will raise the financial problem in developing and developed countries². This trend isn't just noticed in South Asians located in the Indian subcontinent (India, Pakistan, Nepal, Bangladesh), however also noticed in areas with many South Asian immigrants. Financial development, urbanization, and unusual timing of daily meals have been proposed as possible factors involved in this problem's growth and development³.

The metabolic syndrome is linked to several emerging and traditional pro-thrombotic and pro-inflammatory cardiovascular system risk factors: this can lead to a 2 to 4 fold rise in cardiovascular events⁴. Numerous studies have presented strong evidence for the affiliation of Metabolic Syndrome with severe coronary syndrome. In recent clinical studies, MS has been linked to an elevated probability of vascular disease. However, there's very little information regarding the prognosis in cardiovascular sufferers with described metabolic syndrome, specifically in Japan⁵.

The analytical definition for metabolic syndrome involves weight problems; however, the threshold may differ in accordance with ethnicity. In view of this declaration, the International Diabetes Federation suggested new diagnostic standards where the ethnic particular waist circumference beliefs had been incorporated like an essential condition. MS meanings in Asia included waist circumference and have been used in medical practice. Metabolic Syndrome has been ambiguously famous for many years in the clinical setting. However, it was just before many years that the NCEP-III and WHO standards for MS had been recognized. The

idea and value of the metabolic syndrome were recognized and generalized⁶.

Over a decade, the long-term result for individuals with CAD coupled with metabolic syndrome isn't yet clear. It's not possible to use the criteria that include waist circumference whenever we assess the long-term results due to insufficient information regarding waist circumference. Therefore, the BMI has usually been replaced for waist circumference within the current studies.

Research performed by Uppalal B mentioned that metabolic syndrome in individuals along with STEMI was about forty per cent. A Research in 2015 claimed 54.5 per cent of STEMI sufferers with metabolic syndrome⁷. In a research study by Lee MG et al., the occurrence of metabolic syndrome in acute STEMI individuals had been noticed to be 59.5 per cent. Furthermore, current research claimed metabolic syndrome in 42.8 per cent of the sufferers with STEMI⁸.

The local research shows that the frequency of metabolic syndrome had been identified for being 32.5 per cent in STEMI individuals as well as the general element of MS as a risk for the acute coronary syndrome was hypertension noticed in 52.6 % individuals, and diabetes in 42.8 %, central obesity and truncal obesity in 41.2 %, hypertriglyceridemia in 40.0 % and low High-density lipoprotein in 31.7% of individuals⁹.

MATERIALS AND METHODS

This research study was conducted in the Dept. of Adult Cardiology, National Institute of Cardiac Disorders in Karachi. The time period of this study was 6-months. The sample size was measured using WHO sample-size calculator version-2.0 thinking about low high-density lipoprotein in 31.7% in STEMI sufferers as an occurrence, with 95 % confidence interval (CI), and seven % margin of error, the sample size in the study was 170. Non-probability sequential sampling was applied during the research study.

Sample Selection

Inclusion Criteria:

Sufferers with the following criteria were involved in this research study;

- Age from eighteen to forty years.
- Both genders (Male and Female).
- Individuals diagnosed having STEMI.

Exclusion Criteria:

Individuals had been omitted from this research-based upon the following criteria;

- Patient with an earlier record of STEMI.
- Sufferers with an earlier record of any heart related surgical treatment.
- Patients decline to give consent.
- In women; pregnancy (pregnancy of over 30 days)

Data Collection Method: The research was started after acceptance from CPSP (College of Physicians and Surgeons Pakistan). Approval of the ethical evaluation committee of the National Institute of Cardiac Diseases was taken before the data collection. The research included sufferers showing acute ST-elevation myocardial infarction to the young cardiology dept., National Institute of Cardiac Diseases, Karachi, as well as attained the exclusion and inclusion criteria. Before inclusion, the aim and advantages of the research had been described to all respondents.

Weight (kilograms), age (years), height (centimetres), and gender were reported during admission. BMI was measured by dividing weight (kilograms) by sq. of height (meters). Record of the sufferers was taken, as per the practical explanations, relating to smoking status, MS, and aspects of the metabolic syndrome (BMI >23 kilograms meter per square, high blood pressure, hypertriglyceridemia, low-plasma HDLc, and affected fasting

plasma glucose). All of the gathered information was noted on proforma included two sections: demographics and information regarding diseases. Patient info had been kept safe and accessible to official persons only.

Data Analysis Method: Data was entered and analysed using SPSS version 21 for quantitative factors, for example, age, body weight (kilograms), height (centimetres), and Body mass index (kg meter per square). Quantitative variables had been indicated using suitable descriptive statistics, for example, mean±SD.

Percentages and frequencies were measured for specific variables, for example, age group, gender, smoking status (Yes/No), metabolic syndrome, and aspects of the MS (BMI >23 kg/m2, hypertriglyceridemia, hypertension, impaired fasting plasma glucose and low plasma HDLc). Effect modifiers such as age ranges, gender, and smoking status were manipulated via stratification. Post-stratification right fisher exact test and chi-square test were used during the research study. A two-sided p-value of = 0.05 had been taken as a criterion of significance.

RESULTS

Total of 170 sufferers of both gender, having aged between eighteen to forty years who have been diagnosed with STEMI, were involved in the research to figure out the occurrence of MS and assess the distribution of aspects of the metabolic syndrome (MS). Effect modifiers had been manipulated by stratification. The post-stratification chi-square test was used, and p-value =0.05 was regarded as significant.

The results demonstrated that 98 participants were male and 72 were female sufferers in the research. The frequency distribution is also shown in the Tables below.

Demographics	Male	Female	
Gender	98 (57.6%)	72 (42.4%)	
Age (Years)	29.84±7.96	27.80±9.99	MD (IQR) 31.00 (16%)
Variables	YES	NO	N
Smokers, n (%)	104 (61.2%)	66 (28.8%)	170
Metabolic Syndrome, n (%)	110 (64.7%)	60 (35.3%)	170
Metabolic Syndrome Component - BMI > 23kg/m ²	165 (97.1%)	5 (2.9%)	170
Metabolic Syndrome Component Hypertension	123 (72.4%)	47 (27.6%)	170
Metabolic Syndrome Component Hypertension Hypertriglyceridemia	132 (77.6%)	38 (22.4%)	170
Metabolic Syndrome Component – Low Plasma HDLc	75 (44.1%)	95 (55.9%)	170
Metabolic Syndrome Component – Impaired Fasting Plasma Glucose	80 (47.1%)	90 (53.9%)	170

Descriptive statistics of age group (years) was measured, and it was discovered that the mean±SD of the age of the research individuals was 29.84±7.96 years. The in-depth descriptive statistics of age are also shown in the Tables below.

Variables	YES (110)	NO (60)	P-Value
Male	69 (70.9 %)	29 (29.6%)	0.070**
Female	41 (56.9%)	31 (43.2%)	0.070**
Age ≤ 30 years	61 (70.1%)	26 (29.9%)	0.131**
Age > 30 years	49 (59.0%)	34 (41.0%)	0.131**
Smoking (Yes)	75 (72.1 %)	29 (27.9%)	0.011*
Smoking (No)	35 (53.0%)	31 (47.0%)	0.011*

Age was also stratified in groups. of 170 patients with ST-segment elevation myocardial infarction, 39.89 % were people who smoke, and 61.2 % were non-smokers. Metabolic syndrome (MS) was positive in 64.7 % of individuals. So far as components are involved, it had been noticed that BMI >23 kg meter per square was noticed among 97.1 % sufferers. Hypertension had been seen in 72.4 % of people. Hypertriglyceridemia was found in 77.65 % of individuals, 44.1% of patients were affected by Low plasma HDLc, and Impaired fasting Glycaemia was >100 mg/dL in 47.1 % of sufferers. The thorough results of the frequency distribution are shown in the tables below.

Stratification regarding age and gender was completed by using the chi-square test. P-value =0.05 was regarded as significant. The final results demonstrated a significant metabolic

syndrome (MS) connection with smoking (P=0.011). No substantial affiliation of MS was noticed with age (P=0.131), and gender (P=0.070).

Variables	YES (165)	NO (5)	P-Value
Male	94 (95.9 %)	4 (4.1%)	0.397**
Female	71 (98.6%)	1 (1.4%)	0.397**
Age ≤ 30 years	84 (96.6%)	3 (3.4%)	1.000**
Age > 30 years	81 (97.6%)	2 (2.4%)	1.000**
Smoking (Yes)	100 (96.2 %)	4 (3.8%)	0.650*
Smoking (No)	65 (98.5%)	1 (1.5%)	0.650*

The results demonstrated that a significant connection of hypertension was noticed with smoking (p-value =0.043). Age was connected with Low plasma HDLc (p-value =0.019) and Impaired fasting glycaemia (p-value =0.030).

Variables	YES (132)	NO (38)	P-Value
Male	74 (75.5 %)	24 (24.5%)	0.279**
Female	49 (68.1%)	23 (31.9%)	0.279**
Age ≤ 30 years	65 (74.7%)	22 (25.3%)	1.481**
Age > 30 years	58 (69.9%)	25 (30.1%)	1.481**
Smoking (Yes)	81 (77.9 %)	23 (22.1%)	0.043*
Smoking (No)	42 (63.6%)	24 (36.4%)	0.043*

DISCUSSION

Metabolic syndrome can be described as a biological and clinical entity of non-lipid and lipid aspects of metabolic origin that spots individuals vulnerable to cerebrovascular and heart-related diseases. The prevalence of coronary disease and MS are among South Asians is growing. This tendency isn't just noticed in South Asians living in the Indian subcontinent however is also seen in areas with many South Asian immigrants¹⁰. Approximately 20 to 25 per cent of South Asians have produced metabolic syndrome, and much more might be vulnerable to it¹¹. In 2005, fifty-eight million individuals passed away from cardiovascular disease, responsible for thirty per cent of all fatalities across the world; over half these fatalities were in developing nations³. If the risks linked to cardiovascular disease are overlooked, then by 2030, as soon as the world human population is likely to reach 8.2 billion, thirty-three per cent of all fatalities will be a result of cardiovascular disease.

Many expert groups have tried to determine the diagnostic criteria for MS. In 1998, the WHO suggested a proper meaning of the metabolic syndrome; as per this, an individual should have both insulin resistance and glucose intolerance and a couple of the following 4 criteria: hypertension, central obesity, albuminuria, and dyslipidemia. In 2001, the National Cholesterol Education Program Adult Treatment Panel III presented a different explanation for the MS, in accordance with that an individual should have 3 of the following five problems: hypertension, abdominal adiposity, low HDL cholesterol, elevated fasting glucose, and hypertriglyceridemia¹². In accordance with the explanations of NCEP ATP III, a cross sectional study performed through the 3rd National Nutrition and Health Examination Survey in the United States population discovered that the occurrence of the MS was 25 per cent among white US residents; the prevalence was 44 per cent among those fifty years and older¹³.

Current estimations of the prevalence of MS varied from 21.3 to 32.8 % in the contributors in the Framingham Offspring Study and the Washington Heart Study⁷. Furthermore, research conducted recently in sufferers with heart disease or stroke demonstrated that the prevalence of MS is linked with the level of vascular damage. One research demonstrated that sufferers with STEMI had a higher prevalence of metabolic syndrome (46.8 %) ¹⁴.

In an earlier Turkish study, 217 sufferers (mean age 49.1±13 years) with heart disease, the prevalence of Metabolic Syndrome was claimed 53 %. Other research studies claimed the prevalence of metabolic syndrome in Severe coronary syndrome is 29% to 66%¹⁵. In a cross-sectional research, the prevalence of metabolic syndrome was discovered 49.7 % in adult sufferers admitted to cardiology department¹⁶. In one more research, 1255 sufferers aged about sixty-five years old and more with no severe disease were examined, and the prevalence of metabolic syndrome was described as 23.8 %¹⁷.

In one research, the prevalence of low HDLc levels had been observed commonly in every group. Statistical importance among sufferers without and with metabolic syndrome was managed even if sufferers with identified or recently declared DM were excluded. Simultaneously, low HDLc level had been a general element of metabolic syndrome and raised TG. The ATP III determined that reduced HDLc levels and higher TG levels are cardiac risks, no matter LDLc concentrations. And they're common in young patients with STEMI; however, the 1st target is LDLc level as per present guidelines in all ages¹⁸.

The most prevalent triad combination of metabolic syndrome was impaired glucose threshold, lower HDLc level, and raised TG in the MS group with no excluding DM. Within retrospective research of 574 sufferers with ACS, lower HDLc, hypertension and impaired glucose threshold were the most common triad of MS. Colleen et al. claimed features of STEMI in young patients aged about <35. They claimed that young individuals with acute STEMI demonstrated a variety of single vessel diseases and serious anterior STEMI because of occluded LAD artery.

CONCLUSION

Metabolic syndrome (MS) is among this century's serious public health problems. The research results demonstrated a 64.7 % occurrence of MS among our young. It was also concluded by the research findings that the prevalence of metabolic syndrome in young sufferers with STEMI is higher. Additionally, the commonest aspect was BMI >23 kg/m², Hypertriglyceridemia and High blood pressure. Findings outlined the necessity to implement precautionary techniques for reducing over-all cardiac risks in young sufferers having metabolic syndrome (MS).

REFERENCES

- Alberti KG, Zimmet P, Shaw J. Metabolic syndrome—a new worldwide definition. a consensus statement from the international diabetes federation. *Diabetic Med.* 2006 May 1; 23(5):469-80.
- Alberti KG, Zimmet P, Shaw J. The metabolic syndrome—a new worldwide definition. *Lancet.* 2005 Sep 24; 366(9491):1059-62.
- Alexander CM, Landsman PB, Teutsch SM, Haffner SM. NCEP-defined metabolic syndrome, diabetes, and prevalence of coronary heart disease among NHANES III participants age 50 years and older. *Diabetes.* 2003 May 1; 52(5):1210-4.
- Alshehri AM. Metabolic syndrome and cardiovascular risk. *J Family Community Med.* 2010; 17(2):73-8.
- Cankurtaran M, Halil M, Yavuz BB, Dagli N, Oyan B, Ariogul S, et al. Prevalence and correlates of metabolic syndrome (MS) in older adults. *Arch GerontolGeriatr* 2006; 42:35-45.
- 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. *CardiovascRevasc Med* 2006; 7:7-11.
- Colkesen AY, Acil T, Demircan S, Sezgin AT, Muderrisoglu H. Coronary lesion type, location, and characteristics of acute ST elevation myocardial infarction in young adults under 35 years of age. *Coron Artery Dis* 2008; 19:345-7.
- Djordjevic DB, Tasic IS, Nedeljkovic IP. Impact of metabolic syndrome on clinical severity and long term prognosis in patients with myocardial infarction with ST segment elevation. *Hellenic J Cardiol.* 2018 Feb 13.
- Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: Findings from the Third National Health and Nutrition Examination Survey. *JAMA.* 2002; 287:356–9.
- Jover A, Corbella E, Muñoz A, Millán J, Pintó X, Mangas A, et al. Prevalence of metabolic syndrome and its components in patients with acute coronary syndrome. *Rev EspCardiol* 2011;64:579-86
- Kasai T, Miyauchi K, Kurata T, Ohta H, Okazaki S, Miyazaki T, et al. Prognostic value of the metabolic syndrome for long-term outcomes in patients undergoing percutaneous coronary intervention. *Circulation.* 2006; 70(12):1531-7.
- Lakka HM, Laaksonen DE, Lakka TA, Niskanen LK, Kumpusalo E, Tuomilehto J et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. *JAMA.* 2002 Dec 4; 288(21):2709-16.
- Lee MG, Jeong MH, Ahn Y, Chae SC, Hur SH, Hong TJ, et al. Impact of the metabolic syndrome on the clinical outcome of patients with acute ST-elevation myocardial infarction. *J Korean Med Sci.* 2010 Oct 1; 25(10):1456-61.
- Levantesi G, Macchia A, Marfisi R, Franzosi MG, Maggioni AP, Nicolosi GL, et al. Metabolic syndrome and risk of cardiovascular events after myocardial infarction. *J Am CollCardiol* 2005;46:277-83
- Meigs JB, Wilson PW, Nathan DM, D'Agostino RB, Williams K, Haffner SM. Prevalence and characteristics of metabolic syndrome in the San Antonio Heart and Framingham Offspring studies. *Diabetes.* 2003; 52:2160–7.
- Milionis HJ, Kalantzi KJ, Papathanasiou AJ, Kosovitsas AA, Doumas MT, Goudevenos JA. Metabolic syndrome and risk of acute coronary syndromes in patients younger than 45 years of age. *Coron Artery Dis* 2007; 18(4):247-52.
- Misra A, Misra R, Wijesuriya M, Banerjee D. The metabolic syndrome in South Asians: continuing escalation & possible solutions. *Indian J Med Res.* 2007 Mar 1; 125(3):345.
- Mohan V, Deepa M. The metabolic syndrome in developing countries. *Diabetes Voice.* 2006; 51.