ECRONICON OPEN ACCESS

EC CARDIOLOGY
Research Article

Description of the Components of the Metabolic Syndrome in Patients with Myocardial Infarction

Abid H Laghari[1]*, Naseer Ahmed[2], Marvi Zaur[3] and Khawar Abbas Kazmi[4]

[1]*Department of Medicine, Section of Cardiology, The Aga Khan University, Karachi, Pakistan*

[2]*Department of Biological and Biomedical Sciences, The Aga Khan University, Karachi, Pakistan*

[3]*Department of Anatomy, Baqai Medical University, Karachi, Pakistan*

[4]*National Institute of Cardiovascular Diseases, Karachi, Pakistan*

***Corresponding Author:** Abid H Laghari, Department of Medicine, Section of Cardiology, The Aga Khan University, Karachi, Pakistan.

Received: June 01, 2020; **Published:** August 31, 2020

Abstract

Objective: To describe the prevalence of metabolic syndrome (MS) and its components in acute myocardial infarction.

Methods: A prospective cross sectional study was conducted at Coronary Care Unit (CCU) at Aga Khan University Hospital from 1st June 2017 to 30th November 2018. Adult Patients, who were admitted with Acute Myocardial Infarction (AMI) were assessed for the components of MS including HDL, TG, FBS, BP and WC. Metabolic Syndrome was labeled, if patient had three or more components.

Results: Total 120 AMI (50 STEMI, 70 NSTEMI) patients (79 Males, 41 Females; mean age 62.1 ± 12.98 years) were included and evaluated for MS and its individual components. Overall Metabolic Syndrome was present in 84 patients (70% of total patients; 73% of female and 63% of male patients). The most common component was low HDL (78.3% of total patients), followed by raised BP (71.66% of total patients). The remaining Metabolic Syndrome components, impaired fasting blood sugar levels, increased waist circumference and raised TG levels were present in 65%, 53.3% and 24.16% of total patients respectively.

Conclusion: In this study, the prevalence of metabolic syndrome was high (70%) in patients with myocardial infarction. The most frequent component was a low HDL level, followed by a rise in blood pressure.

Keywords: *Myocardial Infarction; Metabolic Syndrome; High-Density Lipoprotein (HDL); Blood Pressure*

Introduction

Myocardial infarction is major component of cardiovascular disease which counts one third of the death worldwide annually. In Pakistan prevalence of coronary artery disease is 26.9%; 23.7% in men and 30% in women [1]. There are many risk factors that are almost unique to the south Asians. The usual risk factors do not account for such high rates of CAD as are present in south Asia [2]. Obesity and particularly its harmful form, visceral adiposity, has reached a very high prevalence in the industrialized world because of lack of exercise and the widely available energy rich food [2]. The metabolic syndrome, characterized by a combination of cardiovascular disease risk factors including dyslipidemia, impaired glucose tolerance, hypertension and abdominal obesity is highly prevalent in patients with coronary artery disease [3,4]. Metabolic syndrome in acute myocardial infarction is associated with increased morbidity, including large infarct size, higher in-hospital complication rates [5]. Waist circumference (WC) is considered an important marker of abdominal fat mass [6]. In healthy subjects, WC is a better predictor of acute coronary artery disease events than body mass index [7]. In men, a lower BMI at a given waist circumference has been suggested to be associated with higher levels of visceral fatty tissue [8]. In patients with high waist

circumference but normal BMI, a strikingly bad outcome is observed, which presumably indicates the presence of visceral fat with low muscle mass and a lack of functional subcutaneous fatty tissue [9]. The identification of such high risk individuals has potential major clinical importance and may warrant more aggressive lifestyle and therapeutic interventions for secondary prevention after acute coronary event.

The prevalence of metabolic syndrome in Pakistani population (According NCEP ATP 3 Definition) is 31%; 20% in men and 40% in women [10]. Prevalence of Metabolic syndrome in patients with myocardial infarction is 46% [11], but there is limited data on Metabolic Syndrome and its individual components. Studies on metabolic syndrome and risk factors for cardiovascular disease are warranted in Pakistan because parts of Pakistani population are experiencing a shift in risk factors from those of under nutrition to over nutrition and overweight.

Patients and Methods

This prospective cross sectional study was conducted at Coronary Care Unit (CCU) Aga Khan University Hospital Karachi. All patients above 20 years of age admitted in CCU with diagnosis of Myocardial infarction from 1st June 2017 to 30th November 2018 were included in this study. The purpose and procedure were explained to the patients and informed consent was taken. Every patient was assessed for components of metabolic syndrome including Fasting HDL, Fasting Triglycerides, Fasting Blood sugar, Blood Pressure and waist circumference was measured with flexible tape.

The diagnosis of Myocardial infarction was labeled when patient had cardiac origin chest pain plus any one of following:

1. Troponin-I > 1.0
2. ECG showing new ST segment elevation in ≥ 2 contiguous leads measuring ≥ 2 mm in leads V1 to V3 or ≥ 1 mm in all other leads.
3. New onset left bundle branch block (LBBB).

   Whereas metabolic syndrome was labeled when any three or more of the following five components were present.

4. Abdominal obesity, defined as a waist circumference > 80 cm in women and > 90 cm in men measured at highest level of iliac crest [12].
5. Serum triglycerides > 150 mg/dl.
6. Serum HDL cholesterol < 40 mg/dl in men and < 50 mg/dl in women.
7. Blood pressure systolic > 130 and diastolic > 85 mmHg.
8. Fasting plasma glucose > 100 mg/dl.

Patients who had prior history of Diabetes Mellitus, Hypertension, previously treated for dyslipidemia were not included in this study. Pregnant patients and patients who had ascites which can confound with waist circumference (WC) were also not included in this study.

All analyses were conducted by using the Statistical package for social science SPSS (Release 15.0, standard version, copyright © SPSS; 1989-02). A descriptive analysis is present as mean ± standard deviation for quantitative variable i.e. Age, number (Percentage) for qualitative variables i.e. Gender. Subjects are categorized into Fasting blood sugar > 100 mg/dl and < 100 mg/dl. HDL < 40 mg/dl and > 40 mg/dl in men and < 50 mg/dl and > 50 mg/dl in women. Triglycerides > 150 mg/dl and < 150 mg/dl. Waist circumference > 90 cm and < 90 cm in men, > 80 cm and < 80 cm in women, systolic blood pressure of > 140 mm Hg and < 140 mmHg, diastolic blood pressure of > 85 mm Hg and < 85 mmHg. Frequency and proportions were calculated for all these variables.

Results

Out of total 120 myocardial infarction (MI) patients, 79 patients (65.83%) were male and 41 patients (34.16%) were female (Table 1). Mean age was 62.08 ± 13 years and age range between 25 to 89 years. Fifty patients (41.66%) were diagnosed ST elevation myocardial infarction (STEMI) and remaining seventy patients (58.33%) had Non-ST elevation Myocardial infarction (NSTEMI) (Table 1). Overall metabolic syndrome was present in 84 patients (70%) of all MI patients. Gender wise MS was present in 73% of female patients and 63% of male patients. The most common component was low HDL (< 40 mg/dl in males and < 50 mg/dl in females). In all MI patients, 78.3% of patients had low HDL levels. Second most common component was raised Blood Pressure (Systolic BP >130 mmHg/ Diastolic BP > 85) which was present in 71.66% of total patients. The remaining Metabolic Syndrome components, impaired fasting blood sugar levels, increased waist circumference and raised TG levels were present in 65%, 53.3% and 24.16% of total patients respectively (Figure 1).

Baseline Characteristics N= (%)	
Number of patients N (%)	120 (100)
Age (years) (mean ± SD)	59 ± 7.8
Males	79
Hypertension	55 (45.8)
Diabetes mellitus	42 (35)
Smoking	80 (66.7)
Coronary artery disease	39 (32.5)
BMI, kg/m^2 (mean ± SD)	24.6 ± 3.2
Patients according to BMI	
Normal (< 25 kg/m^2)	72 (60)
Overweight (25 - 30 kg/m^2)	30 (25)
Obese	18 (15)
Blood pressure (mm Hg)	
Systolic (mean ± SD)	135 ± 20.8
Diastolic (mean ± SD)	85 ± 11.3
Waist circumference cm (mean ± SD)	
Male	88 ± 9.5
Female	84.3 ± 8.6
Lipid profile	
Total cholesterol (mean ± SD)	191 ± 51
High density lipoprotein (HDL) (mean ± SD)	35.1 ± 15.4
Low density lipoprotein (mean ± SD)	107.8 ± 50.4
Triglycerides (mean ± SD)	101.5 ± 50.5
Fasting blood sugar (mean ± SD)	125.3 ± 49.9
Metabolic syndrome components	
Elevated waist circumference	57 (47.5)
Elevated triglycerides	27 (22.5)
Reduced HDL cholesterol	84 (70)
Elevated blood pressure	74 (60.8)
Elevated fasting plasma glucose	73 (60.8)

Table 1: *Characteristics of study patients.*

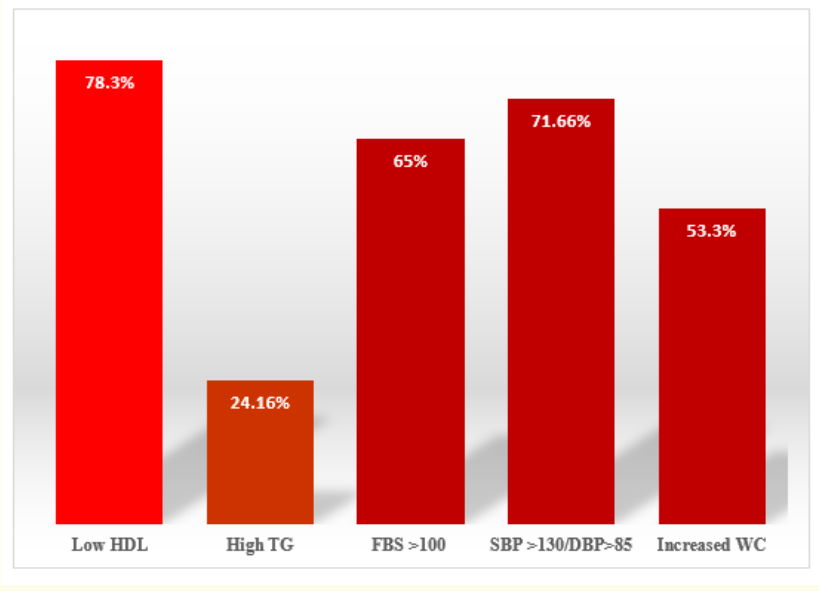

Figure 1: *Bar chart of metabolic syndrome components percentage in MI patients.*

Discussion

MI patients in our population have comparatively more burden of metabolic syndrome than Western population. Overall frequency of metabolic syndrome was higher significantly as compared to previous study that reflects how change in life style increasing burden of MS from 46% in 2008 to 70% in recent study. Clustering of cardiovascular risk factors is observed in metabolic syndrome (MS), but the relative contribution of different factors to determine outcomes remains largely unknown [13]. Literature shows that angiographic scores for extension and severity of lesions are higher in the metabolic syndrome than in the non-metabolic syndrome group [14]. In this study the frequency of metabolic syndrome was more common in female patients with MI, which coincides with previous studies [13]. This study showed 73.17% of female patients and 68.35% of male patients had metabolic syndrome. Other studies have also shown that effect of metabolic syndrome in CAD scores has been observed to be more pronounced in females than in males [14]. Metabolic syndrome was common in young to middle age (between 45 to 65 years) group of patients (Table 1). In previous studies mostly done in western countries, raised blood pressure was the most common component of metabolic syndrome but the current study identified that in our population low HDL was the most common component and raised blood pressure was the second most common. Most effective way to enhance HDL levels are regular exercise. The study identified that impaired fasting blood sugar levels i.e. FBS > 100 indicating insulin resistant was the third most common component of metabolic syndrome. Evidence from other studies have shown that visceral obesity is associated with insulin resistance on peripheral glucose and fatty acid utilization; often resulting to type 2 DM. IDEA revealed that the frequency of adiposity is high in all regions of the world, even in Asian populations that are commonly considered to be lean. These lower levels of adiposity in some regions of the world like southern and eastern Asia are not necessarily reassuring, as the impact of adiposity, particularly central adiposity is increasing and may be more acute in certain populations.[7] In our study the abdominal obesity identified by measuring waist circumference was present in more than half of all myocardial infarction patients. Obesity, in particular visceral adiposity is linked with increased risk of cardiovascular disease (CVD) and DM [15,16]. Literature has shown that patients with high waist circumference but normal BMI, a strikingly bad outcome is observed, which presumably indicates the presence of visceral fat with low muscle mass and a lack of functional subcutaneous fatty tissue [9]. The Diabetes Prevention Program has shown the beneficial effects of weight reduction and objective measures of improvements in the arterial wall can be identified soon after implementation of lifestyle changes, like diet

and physical exercise [17]. IDEA emphasizes the necessity for a global approach to adiposity from early years of life. Adiposity in younger population particularly at teen age is rapidly rising and is associated with adverse changes in arterial wall function and structure; the initial stages of atherosclerosis [18]. The raised TG levels were present in about quarter of MI patients. Environmental factors may have effect on genes and may lead to certain genetic modifications. Whether which one of the common risk factors like physical inactivity, diet, environment factors or hereditary factors is the initiating event or it is an interaction between all these, it is hard to predict. Generally, it looks that metabolic syndrome is the result of interaction between all these risk factors. Genome scans have identified strong link between certain chromosomal regions and MS [19].

Conclusion

Metabolic syndrome, potentially modifiable risk factor for having coronary artery disease is very common in MI patients of either genders but comparatively more common in women. The low HDL is the most common component of metabolic syndrome followed by raised Blood pressure, which indicates the importance of environmental influences, such as low levels of physical activity and availability of calorie-rich diets.

Bibliography

1. Jafar TH., *et al*. "Heart disease epidemic in Pakistan: women and men at equal risk". *American Heart Journal* 150.2 (2005): 221-226.
2. Mathieu P., *et al*. "Visceral obesity and the heart". *The International Journal of Biochemistry and Cell Biology* 40.5 (2008): 821-836.
3. Wierzbicki AS., *et al*. "Waist circumference, metabolic syndrome and coronary artery disease in a Pakistani cohort". *International Journal of Cardiology* 128.1 (2008): 77-82.
4. Ahmad U and Frossard PM. "Coronary heart disease in South Asia: Need to redefine risk". *International Journal of Cardiology* 107.2 (2006): 289-290.
5. Clavijo LC., *et al*. "Metabolic syndrome in patients with acute myocardial infarction is associated with increased infarct size and in-hospital complications". *Cardiovascular Revascularization Medicine* 7.1 (2006): 7-11.
6. Pristipino C., *et al*. "Comparison of access-related bleeding complications in women versus men undergoing percutaneous coronary catheterization using the radial versus femoral artery". *The American Journal of Cardiology* 99.9 (2007): 1216-1221.
7. Balkau B., *et al*. "International day for the evaluation of abdominal obesity (IDEA): A study of waist circumference, cardiovascular disease, and diabetes mellitus in 168 000 primary care patients in 63 countries". *Circulation* 116 (2007): 1942-1951.
8. Kragelund C., *et al*. "Impact of obesity on long-term prognosis following acute myocardial infarction". *International Journal of Cardiology* 98.1 (2005): 123-131.
9. Zeller M., *et al*. "Relation between body mass index, waist circumference, and death after acute myocardial infarction". *Circulation* 118 (2008): 482-490.
10. Zahid N., *et al*. "High prevalence of obesity, dyslipidemia and metabolic syndrome in a rural area in Pakistan". *Diabetes and Metabolic Syndrome: Clinical Research and Reviews* 2.1 (2008): 13-19.
11. Zeller M., *et al*. "Prevalence and impact of metabolic syndrome on hospital outcomes in acute myocardial infarction". *ACC Current Journal Review*14.9 (2005): 6.
12. Tziomalos K., *et al*. "Vascular risk factors in South Asians". *International Journal of Cardiology* 128.1 (2008): 5-16.
13. Lanz JR., *et al*. "Metabolic syndrome and coronary artery disease: Is there a gender specific effect?" *International Journal of Cardiology* 107.3 (2006): 317-321.

14. Pirat B., *et al*. "Impaired coronary flow reserve in patients with metabolic syndrome". *Atherosclerosis* 201.1 (2008): 112-116.

15. Dagenais GR., *et al*. "Prognosticimpact of body weight and abdominal obesity in women and men with cardiovascular disease". *American Heart Journal* 149 (2005): 54-60.

16. Onat A., *et al*. "Measures of abdominal obesity assessed for visceral adiposity and relation tocoronary risk". *International Journal of Obesity and Related Metabolic Disorders* 28 (2004): 1018-1025.

17. Watts K., *et al*. "Exercise training normalizes vascular dysfunction and improves central adiposity in obese adolescents". *Journal of the American College of Cardiology* 43 (2004): 1823-1827.

18. Whincup PH., *et al*. "Arterial distensibility in adolescents: the influence of adiposity, the metabolic syndrome, and classic risk factors". *Circulation* 112 (2005): 1789-1797.

19. Prasad S., *et al*. "Prevalence of the metabolic syndrome in patients with acute myocardial infarction". *Heart, Lung and Circulation* 17.3 (2008): S136.

Volume 7 Issue 9 September 2020