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Original Article

Study on correlation of obesity with short-term prognosis in acute myocardial infarction

Vellani Haridasan [a,*], K.F. Rajesh [b], C.G. Sajeev [c], G. Rajesh [d], Cicy Bastion [d], D. Vinayakumar [d], P. Kadermuneer [d], Dolly Mathew [a], Biju George [e], M.N. Krishnan [f]

[a] Assistant Professor, Department of Cardiology, Government Medical College, Kozhikode, Kerala, India
[b] Senior Resident, Department of Cardiology, Government Medical College, Kozhikode, Kerala, India
[c] Professor, Department of Cardiology, Government Medical College, Kozhikode, Kerala, India
[d] Additional Professor, Department of Cardiology, Government Medical College, Kozhikode, Kerala, India
[e] Assistant Professor, Department of Community Medicine, Government Medical College, Kozhikode, Kerala, India
[f] Professor and Head, Department of Cardiology, Government Medical College, Kozhikode, Kerala, India

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ABSTRACT

Background: Obese patients with established coronary artery disease have reduced mortality compared to normal or low body mass index (BMI) patients. The reason for the relation is not yet clearly understood. We sought to evaluate the association of BMI and waist circumference (WC) at the time of presentation in patients with myocardial infarction (MI) with one-year adverse cardiac events.

Methods: In this prospective cohort study, we included consecutive patients with acute MI admitted to a tertiary care hospital during a period of one year. Upon admission, BMI and WC were measured. Patients were followed-up for a period of one year and the primary composite outcome of death or non-fatal MI was correlated with BMI and WC categories.

Results: There were 703 patients (males 559 (79.5%)). Combined non-fatal MI and death at one year was 128 (18.2%). Incidence of primary outcome was 25.0% in low BMI group, 19.9% in normal BMI group, 13.1% in overweight group, 13.4% in class I obese, and 11.1% in class II obese groups. In univariate analysis, the inverse correlation was significant (p value = 0.007). In one-year follow-up period, 12.8% in high and 20.8% in normal WC groups had primary outcome (p value = 0.01). Both BMI and WC lost their predictive value in multivariate analysis.

Conclusions: Low BMI and normal WC were associated with a worse short-term outcome in patients with acute MI. Neither BMI nor WC independently predicted cardiac events or death after acute MI.

* *Corresponding author.*
E-mail address: drharidasanv@yahoo.com (V. Haridasan).
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1. Introduction

Obesity, which is established as a risk factor for the development of cardiovascular diseases, has assumed epidemic proportions globally in adults as well as in children. Body mass index (BMI) is the most accepted parameter for the definition and categorization of obesity. Based on BMI, an individual is classified as underweight (BMI <18.5 kg/m^2), normal (18.5–22.9 kg/m^2), overweight (23–24.9 kg/m^2), class I obese (25–29.9 kg/m^2), or class II obese (>30 kg/m^2).[1] Excess abdominal fat deposition is established as a cardiovascular risk factor over and above the general obesity. Waist circumference (WC) is an accepted parameter for measuring this abdominal obesity. High WC is defined as WC greater than 90 cm in men and 80 cm in women.[1]

Because of its maladaptive effects on various cardiovascular risk factors and its adverse effects on cardiovascular structure and function, obesity has a major impact on cardiovascular diseases, such as coronary artery diseases (CAD),[2] heart failure (HF),[3] sudden cardiac death,[4] and atrial fibrillation,[5] and is associated with reduced overall survival. Based on these observations, virtually all national and international guidelines recommend weight loss for overweight and obese patients for the primary and secondary prevention of cardiovascular disease.[6,7]

Although obesity is clearly a risk factor for developing CAD and HF, in patients in whom these diseases are established, obesity is reported to have an inverse correlation with all-cause mortality,[8] cardiovascular mortality,[9] and need for repeat revascularization.[10] It was found that obese patients with established CAD had reduced mortality compared with normal BMI patients, whether treated medically, by percutaneous coronary intervention (PCI) or by coronary artery bypass surgery (CABG). The highest mortality rates are observed in patients with a very low BMI (<18.5 kg/m^2). This observation has been referred to as the 'obesity paradox'.[10,11] Though there are several studies related to obesity paradox, the reason for the paradoxical U- or J-shaped relation between BMI and adverse outcome is not yet understood. Several explanations have been suggested for this phenomenon.

Most of the previous studies on obesity paradox are retrospective in nature. BMI was the most commonly used epidemiological measure of obesity in these studies. It does not directly distinguish between central from peripheral adiposity.[12] Other indices having better predictive power, but less commonly used, include WC, waist-to-hip ratio, and weight-to-height ratio.[13] There are scant data published on paradoxical relation of obesity and CAD, particularly in patients with acute coronary syndromes from India.

2. Methods

In this prospective cohort study, patients admitted to cardiology department of a tertiary hospital with a diagnosis of acute ST elevation myocardial infarction (STEMI) or acute non-ST elevation myocardial infarction (NSTEMI) were included. ST-elevation MI and NSTEMI were defined according to American College of Cardiology Foundation/American Heart Association (ACCF/AHA) guidelines.[14,15]

Exclusion criteria were history of myocardial infarction (MI) in the last six months, severe valvular heart disease, conditions where anthropometric measurements were not possible and severe non-cardiac illness limiting survival to less than one year.

Baseline data were collected regarding conventional CAD risk factors (diabetes mellitus, hypertension, smoking, and dyslipidemia), ECG manifestations, biochemical values, Thrombolysis in myocardial infarction (TIMI) score, and Killip class at presentation. Overnight fasting blood samples were collected on the morning after admission for blood lipid and blood sugar measurements. Details of reperfusion procedures (thrombolysis or PCI) were noted. Details of pre-discharge coronary angiogram (CAG) and revascularization, if any, were recorded.

Anthropometric parameters were measured during admission to hospital. Height was measured by wall-mounted tape to the nearest centimeter. Subjects were asked to stand upright without shoes, with their back against the wall, heels together, and eyes directed forward. Weight was measured with portable weighing scale kept on a firm horizontal surface. The subjects were asked to wear light clothing and remove footwear. Weight was recorded to the nearest kilogram. WC was measured using a non-stretchable measuring tape. The subjects were asked to stand erect in a relaxed position with both feet together. Waist girth was measured at the midpoint between the iliac crest and the lower margin of the ribs at the end of expiration, to the nearest centimeter. Patients were categorized into BMI and WC groups according to WHO Classification of BMI and WC in Asian adults.[16]

Follow-up was done at one month, three months, six months, and one year after discharge. Follow-up was performed either in special clinic conducted for study or by telephonic interview. Patients who report events over phone were called to special clinic for verification of records.

Primary outcome was a composite of death due to any cause or non-fatal MI at one year. Secondary outcome was in-hospital mortality. BMI and WC at admission were correlated with both primary and secondary outcomes.

Statistical analysis was performed using Statistical Package for Social Science software (SPSS Inc Chicago, Illinois version 18). Qualitative variables, expressed as numbers and percents, were compared by the Chi-square test. We used univariate analysis to determine the effect of factors affecting one-year outcomes. Factors that were significant predictors of outcomes were used as independent variables in multiple logistic regression analysis to determine independent predictors of one-year outcome. A p-value of less than 0.05 was considered as statistically significant.

3. Results

There were 703 patients (males 559 (79.5%), females 144 (20.4%)). Of the total group, 100 (14.2%) were underweight, 351 (49.9%) were of normal weight, and 122 (17.3%) were overweight. Class I obesity was seen in 112 (15.9%) and class II obesity in 18 (2.5%) patients (Table 1). High WC was measured in 227 (32%) among a total of 703 patients.