ORIGINAL ARTICLE
DOI: 10.55958/jcvd.v18i1.93

IMPACT OF BODY MASS INDEX ON IN-HOSPITAL MORTALITY IN PATIENTS PRESENTING WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION

Farhan Umair[a], Kiran Iftikhar Sheikh[a], Nimra Ashraf[a*], Azhar Saeed[b], Hafiz Rashid Ali[a], Muhammad Usman Khalid[b]

[a]Punjab Institute of Cardiology, Lahore. [b]Multan Medical and Dental College, Multan

Date of Submission: 08-02-2022; Date of Acceptance: 22-02-2022; Date of Publication: 31-05-2022

ABSTRACT:

INTRODUCTION: *Obesity raises the risk of cardiovascular disease, the clinical result of acute cardiovascular events may be better in people with a high body mass index (BMI).*

AIMS & OBJECTIVE: *The objective of the study was to compare the frequency of in-hospital mortality in underweight, normal, overweight and obese patients presenting with acute ST elevation myocardial infarction.*

MATERIAL & METHODS: *From September 2017 to February 2018, a descriptive case series was held at the Cardiology Ward of the Punjab Institute of Cardiology in Lahore. A total of 350 patients who met the eligibility requirements were enrolled. Then height and weight were noted and BMI was calculated. The patients were followed-up for 5 days after STEMI. If patient died within hospital stay, then in-hospital mortality was labeled.*

RESULTS: *The mean age of patients was 57.94±13.62 years. There were 177 (50.6%) males and 173 (49.4%) females. 160 (45.7%) patients were diabetic while 190 (54.3%) were non-diabetic. The mean BMI of patients was 25.36±5.66 kg/m2. In-hospital mortality occurred in 11 (22.4%) underweight patients, in 8 (7.1%) patients who had normal BMI, in 11 (10.9%) who were overweight while in 9 (10.2%) who were obese. The significant difference was observed and underweight patients had high in-hospital motility ($p<0.05$).*

CONCLUSION: *The frequency of in-hospital mortality was high in underweight patients as compared to normal, overweight or obese patients.*

KEY WORDS: *Body mass index, ST elevation myocardial infarction, in-hospital mortality, underweight, normal, overweight, obese*

Correspondence : Nimra Ashraf, Punjab Institute of Cardiology, Lahore. Email: jasmin_kcite@yahoo.com
Author's Contribution: FU: Manuscript writing, data collection. KIS: Corrections in manuscript. NA: Manuscript writing, data collection. AS: Data analysis. HRA: Data collection. MUK: Proof reading.

INTRODUCTION:

Although obesity raises the risk of cardiovascular illnesses, the clinical result of acute cardiovascular events may be better in people with a high body mass index (BMI).[1] According to a recent study, certain studies of patients with coronary artery disease (CAD) suggest that being overweight or obese reduces the risk of CV events and/or mortality, a phenomenon known as the obesity paradox. However, there is no widespread agreement on the obesity paradox, as other studies contradict this conclusion. [2,3]

BMI is an excellent indicator of general adiposity, and having a high BMI is a known risk factor for a variety of diseases. The average BMI has been growing by a few percent every decade in many populations, raising concerns about the implications of increased adiposity on health.[4] The BMI paradox in hospitalised patients with STEMI has produced mixed results. Previous research has shown that obese patients have a lower in-hospital mortality rate than those with a low BMI, but when confounders were taken into account, the significant negative relationship was lost, weakening the hypothesis that obesity is an independent protective factor in obese patients.[4,5]

The goal of this study is to determine the prevalence of various BMIs in patients with acute STEMI and compare in-hospital death rates.

A study showed that there were 4% underweight patients, 36.7% had normal BMI, 33.0% were overweight and 26.2% were obese. In-hospital mortality was 28% among underweight patients,19.3% in normal BMI, 12.1% in overweight patients while in 8.5% obese patients was observed.[7] But one study showed that there were 4.3% underweight patients, 55.1% had normal BMI, 28.7% were overweight and 5.9% were obese. In-hospital mortality was 5.8% among underweight patients, 2.1% in normal BMI, 1.2% in overweight patients while in 2.7% obese patients was observed.

The electrocardiogram may or may not show ST-segment or T-wave changes in patients with ischemia pain (ECG). On the ECG, ST elevations indicate active and ongoing transmural myocardial damage. Most STEMI patients have Q waves in the absence of prompt reperfusion therapy, indicating a dead zone of myocardium that has suffered irreparable damage and death. Those who do not have ST elevations are classified as having unstable angina or having NSTEMI, which is distinguished by the presence of cardiac enzymes. Alterations in the surface ECG, such as ST-segment depressions or T-wave morphological changes, may or may not occur in both of these situations.

The use of beta-blockers, angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, and statins has been shown to be beneficial. The findings from the trial to assess improvement in therapeutic outcomes by optimising platelet inhibition with prasugrel–thrombolysis in myocardial infarction 38, which better outlines a universal definition of MI, as well as a classification system and risk factors for cardiovascular death, were published by the American College of Cardiology/American Heart Association/European Society of Cardiology/World Heart Federation.[7]

Material and Methods: From September 2017 to February 2018, a descriptive case series was held at the Cardiology Ward of the Punjab Institute of Cardiology in Lahore. A total of 350 patients who met the eligibility requirements were enrolled. After that, measurements of height and weight were taken, and the BMI was determined. After STEMI, the patients were observed for 5 days. In-hospital mortality was defined as a patient's death during their stay in the hospital. The method utilised was a non-probability, consecutive sampling strategy. Within 12 hours of symptoms, patients aged 35 to 80 years of either gender who presented with acute STEMI (defined as chest pain lasting more than 30 minutes, ST elevation greater than 2 mm in precordial leads and greater than 1 mm in two contiguous limb leads on ECG, and troponin T greater than 100) were included. Patients who refused to participate in the study or attend counselling sessions. Patients with prior coronary artery bypass grafting, PCI, significant valvular heart disease, congenital heart disease, hypertrophy or dilated cardiomyopathy, substantial cardiogenic shock (medical record), and patients who died within the first 24 hours after presenting with STEMI were excluded.

DATA COLLECTION PROCEDURE:

The study involved 350 patients from the emergency department of PIC, Lahore, who met the eligibility requirements. All patients gave their informed consent. Their demographic information was also recorded (name, age, gender, and SK infusion). The patients underwent assessment for height and weight when got stable. Height and weight of patients was measured, BMI was calculated and patients were categorized in four BMI groups i.e. underweight, normal, overweight and obese. Patients were followed-up for 5 days

after STEMI. If patient died within hospital stay, then in-hospital mortality was labeled (as per operational definition). Patients who survived within 5 days of hospital stay were discharged when they were active to move on their own and can do their routine life activities. All this information was recorded on Performa.

DATA ANALYSIS:

SPSS version 21 was used to do statistical analysis on the acquired data. Quantitative factors such as age and BMI were reported as a mean standard deviation. Gender, BMI classes, and in-hospital mortality were all reported qualitatively as frequency and percentages. In order to compare the frequency of in-hospital mortality in different BMI groups, the Chi-square test was used. P-values less than 0.05 were considered significant.

RESULTS:

The mean age of patients was 57.94±13.62 years (table 1). There were 177 (50.6%) males and 173 (49.4%) females. 160 (45.7%) patients were diabetic while 190 (54.3%) were non-diabetic. The mean BMI of patients was 25.36±5.66 kg/m2. In-hospital mortality occurred in 11 (22.4%) underweight patients, in 8 (7.1%) patients who had normal BMI, in 11 (10.9%) who were overweight while in 9 (10.2%) who were obese. The significant difference was observed and underweight patients had high in-hospital motility ($p<0.05$). In this study, 39 (11.1%) patients had in-hospital mortality while 311 (88.9%) were discharged alive. (Fig-1)

The mean age of patients was57.94±13.62years and the mean BMI of patients was 25.36±5.66kg/m^2. (table-2)

Data was stratified for gender of patients. In male patients, in-hospital mortality occurred in 7 (25.0%) underweight, in 3 (5.3%) with normal BMI, in 5 (9.8%) overweight while in 4 (9.8%) obese patients. The difference was insignificant ($p>0.05$). In female patients, in-hospital mortality occurred in 4 (19.0%)underweight, in 5 (9.1%)with normal

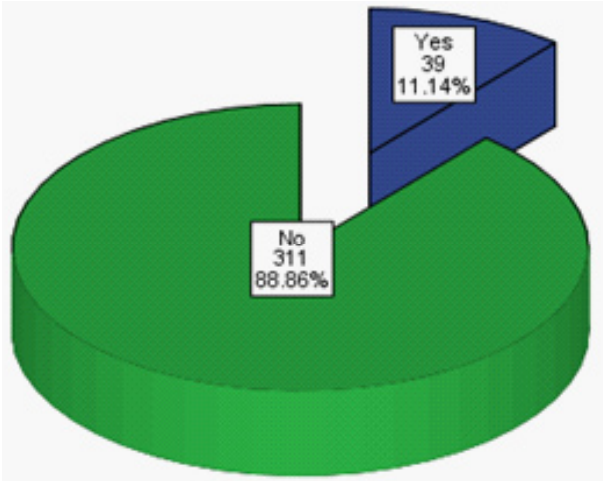

Fig 1: Distribution of in-hospital morality

Table.1 Descriptive Statistics of age and BMI of patient

	Age	BMI(Kg/m²)
N	350	350
Mean	57.94	25.6
SD	13.62	5.66
Minimum	35	15.50
Maximum	80	35.22

Table 2. Comparison of in-hospital mortality in BMI categories stratified for gender

Gender	In-hospital mortality	BMI category				p-value
		Underweight	Normal	Overweight	Obese	
Male	Yes	7 (25.0%)	3 (5.3%)	5 (9.8%)	4 (9.8%)	0.050
	No	21 (75.0%)	54 (94.7%)	46 (90.2%)	37 (90.2%)	
	Total	28 (100%)	57 (100%)	51 (100%)	41 (100%)	
Female	Yes	4 (19.0%)	5 (9.1%)	6 (12.0%)	5 (10.6%)	0.676
	No	17 (81.0%)	50 (90.9%)	44 (88.0%)	42 (89.4%)	
	Total	21 (100%)	55 (100%)	50 (100%)	47 (100%)	

Table 3. Comparison of in-hospital mortality in BMI categories stratified for SK infusion						
SK Infusion	In-hospital mortality	BMI category				p-value
		Underweight	Normal	Overweight	Obese	
Yes	Yes	11 (23.4%)	7 (6.9%)	11 (12.2%)	9 (11.3%)	0.038
	No	36 (76.6%)	95 (93.1%)	79 (87.8%)	71 (88.8%)	
	Total	47 (100%)	102 (100%)	90 (100%)	80 (100%)	
No	Yes	0 (0.0%)	1 (10.0%)	0 (0.0%)	0 (0.0%)	0.538
	No	2 ()100%	9 (90.0%)	11 (100%)	8 (100%)	
	Total	2 (100%)	10 (100%)	11 (100%)	8 (100%)	

BMI, in 6 (12.0%)overweight while in 5 (10.6%) obese patients. The difference was insignificant ($p>0.05$).

In patients given SK infusion (table-3), in-hospital mortality occurred in 11 (23.4% underweight, in 7 (6.9%) with normal BMI, in 11 (12.2%) overweight while in 9 (11.3%) obese patients. The difference was significant ($p<0.05$). In patients without SK infusion, in-hospital mortality occurred in 0 (0.0%)underweight, in 1 (10.0%)with normal BMI, in 0.0%)overweight while in 0 (0.0%) obese patients. The difference was insignificant ($p>0.05$).

DISCUSSION:

BMI is an excellent indicator of general adiposity, and a high BMI is linked to a variety of diseases and conditions, including ischemic heart disease, stroke, and malignancies of the large intestine, kidney, endometrial, and postmenopausal breast.[5,8,9]

In this study, the mean BMI of patients was 25.36±5.66kg/m2. In this study, 49 (14%) were underweight, 112 (32%) had normal BMI, 101 (28.9%) were overweight while 88 (25.1%) were obese. In-hospital mortality occurred in 11 (22.4%) underweight patients, in 8 (7.1%) patients who had normal BMI, in 11 (10.9%) who were overweight while in 9 (10.2%) who were obese. The significant difference was observed and underweight patients had high in-hospital motility ($p<0.05$).

One study showed that there were 11% underweight patients, 57.2% had normal BMI, 28.2% were overweight and 3.7% were obese. In-hospital mortality was 19.9% among underweight patients, 10.3% in normal BMI, 7.3% in overweight patients while in 4.3% obese patients was observed.[7] Another study showed that there were 4% underweight patients, 36.7% had normal BMI, 33.0% were overweight and 26.2% were obese. In-hospital mortality was 28% among underweight patients, 19.3% in normal BMI, 12.1% in overweight patients while in 8.5% obese patients was observed.[10]

A meta-analysis found that when making comparisons a healthy weight group to a coupled overweight and obese group, the pooled RRs for in-hospital mortality were 0.72 (95 percent CI: 0.57–0.90), 0.39 (95 percent CI: 0.28–0.55), 0.66 (95 percent CI: 0.55–0.78), and 0.68 (95 percent CI: 0.57–0.81) for long-term mortality. When the obese group was likened to the overweight group, the RRs were 0.82 (95 percent CI: 0.64–1.06) for in-hospital mortality and 0.94 (95 percent CI: 0.55–1.58) for short-term, 0.82 (95 percent CI: 0.65–1.04) for medium-term, and 0.98 (95 percent CI: 0.88–1.09) for long-term mortality, which were not meaningful.[11]

In this study, 319 (91.1%) received SK infusion while 31 (8.9%) did not received SK infusion. Data was stratified for SK infusion. In patients given SK infusion, in-hospital mortality occurred in 11 (23.4%) underweight, in 7 (6.9%) with normal BMI, in 11 (12.2%) overweight while in 9 (11.3%) obese patients. The difference was significant ($p<0.05$). In patients without SK infusion, in-hospital mortality occurred in 0 (0.0%) underweight, in 1 (10.0%) with normal BMI, in 0 (0.0%) overweight while in 0 (0.0%) obese patients. The difference was insignificant ($p>0.05$).

This obesity paradox need further evaluation in large scale multicenter studies.

CONCLUSION:

Thus the frequency of in-hospital mortality was high in underweight patients as compared to normal, overweight or obese patients.

References:

1. Herrmann, J., et al., Body mass index and acute and long-term outcomes after acute myocardial infarction (from the Harmonizing Outcomes With Revascularization and Stents in Acute Myocardial Infarction Trial). The American journal of cardiology, 2014. 114(1): p. 9-16.
2. Chrysant, S.G. and G.S. Chrysant, New insights into the true nature of the obesity paradox and the lower cardiovascular risk. Journal of the American Society of Hypertension, 2013. 7(1): p. 85-94.
3. Bucholz, E.M., et al., Body mass index and mortality in acute myocardial infarction patients. The American journal of medicine, 2012. 125(8): p. 796-803.
4. Das, S.R., et al., Impact of body weight and extreme obesity on the presentation, treatment, and in-hospital outcomes of 50,149 patients with ST-segment elevation myocardial infarction: results from the NCDR (National Cardiovascular Data Registry). Journal of the American College of Cardiology, 2011. 58(25): p. 2642-2650.
5. Witassek, F., et al., Impact of Body Mass Index on mortality in Swiss hospital patients with ST-elevation myocardial infarction: does an obesity paradox exist? Swiss medical weekly, 2014. 144(3132).
6. Kosuge, M., et al., Impact of body mass index on in-hospital outcomes after percutaneous coronary intervention for ST segment elevation acute myocardial infarction. Circulation Journal, 2007. 72(4): p. 521-525.
7. Bonaca, M.P., et al., American College of Cardiology/American Heart Association/European Society of Cardiology/World Heart Federation universal definition of myocardial infarction classification system and the risk of cardiovascular death: observations from the TRITON-TIMI 38 trial (Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition With Prasugrel–Thrombolysis in Myocardial Infarction 38). Circulation, 2012. 125(4): p. 577-583.
8. Hu, F., Obesity epidemiology. 2008: Oxford University Press.
9. Reeves, G.K., et al., Cancer incidence and mortality in relation to body mass index in the Million Women Study: cohort study. Bmj, 2007. 335(7630): p. 1134.
10. Cheng, C.-C., et al., Body Mass Index and Outcome of Acute Myocardial Infarction–Is There an Obesity Paradox? Acta Cardiologica Sinica, 2013. 29(5): p. 413.
11. Wang, L., et al., Association of overweight and obesity with patient mortality after acute myocardial infarction: a meta-analysis of prospective studies. International Journal of Obesity, 2016. 40(2): p. 220.