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ASSOCIATION OF RAISED BMI WITH MACE IN PATIENTS OF ACUTE CORONARY SYNDROME UNDERGOING PERCUTANEOUS CORONARY INTERVENTION

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ABSTRACT:

BACKGROUND: *Acute coronary syndrome (ACS) refers to a group of conditions. It is the leading cause of death in patients with coronary artery disease (CAD). Obesity is a major risk factor for CAD and is closely linked to increased morbidity and mortality.*

AIMS & OBJECTIVE: *To determine the association of raised Body mass index (BMI) with major adverse cardiovascular events (MACE) in patients of ACS undergoing percutaneous coronary intervention (PCI).*

MATERIAL & METHODS: *Total 120 patients with ACS were enrolled by non-probability consecutive sampling technique. Patients were divided into two groups; group-A with raised BMI (BMI >23kg/m^2) and group-B with non-raised BMI (<23kg/m^2) undergoing PCI for ACS. MACE was recorded after 3 months of clinical follow-up. Post-stratification, RR (Relative Risk) was calculated to check the association. A p-value ≤0.05 was considered statistically significant.*

RESULTS: *Among the raised BMI group, the mean age was 37.9±9.3 years and 39.5±8.2 years in normal BMI group. Among raised BMI group, there were 32(53.3%) males and 28(46.7%) females, while 37(61.7%) males and 23(38.3%) females among non-raised BMI group. The risk ratio of the obese participants was high as 35%.*

CONCLUSION: *Raised BMI individuals are at low risk of in-hospital complications and 3-month MACE and mortality after PCI.*

KEY WORDS: *Acute Coronary Syndrome, Primary Percutaneous Coronary Intervention, MACE*

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INTRODUCTION:

The acute coronary syndrome includes unstable angina (UA), segment elevation myocardial infarction (STEMI), and non-ST segment elevation myocardial infarction (NSTEMI) (ACS). It is the leading cause of death in coronary artery disease (CAD) and is responsible for [1–2] million hospital admissions in the United States each year. Over the past 4 decades, the mortality rate has decreased with the progress of procedures such as 'percutaneous coronary intervention' (PCI). [1]

Obesity is a key factor associated with CAD and is strongly associated with increased morbidity and mortality.[2] Obesity is determined mostly by BMI and waist-to-hip ratio (WHR). Obesity is measured by BMI and WHR is related to central-type obesity Increased BMI is associated with increased cardiovascular comorbidities, such as diabetes, hypertension, and hyperlipidemia, all of which contribute to the progression of CAD.

Even though obesity is linked to cardiovascular disease, it has shown 'a protective effect' in patients undergoing PCI, the phenomenon termed as 'obesity paradox.[3-4] Various studies in After PCI, obese individuals had better clinical results than normal-weight patients in Western countries, demonstrating an "obesity paradox".[5] Another study found that individuals who were underweight or normal weight following ACS had a higher risk of mortality hemorrhage, ischemia, and heart failure than those who had a higher BMI.[6]

A lower death rate was also found among CAD patients undergoing PCI having a higher BMI value categorized as overweight or obese. It was also discovered that individuals who were classified as underweight had a greater mortality rate than those who were of normal weight. The incidence rate of 16.95% and the overweight group had MACE with an incidence rate of 2.90%.[7]

When physiologic stress, such as trauma, blood loss, anemia, infection, or tachyarrhythmia, raises demands on the heart, stable coronary artery disease (CAD) can develop into ACS in the absence of plaque rupture and thrombosis. The presence of the characteristic increase and decrease of biochemical markers of myocardial necrosis is required for Acute myocardial infarction was diagnosed in this case. [8]

ACS is common in people with end-stage renal illness, Moreover, are few documents about ACS's natural history in a dialysis patients Gumurm et al investigated the presentation, care, and outcomes of patients with ACS who had dialysis before their ACS presentation similar to the study showed the association of low BMI with greater risks of major cardiovascular events and death among patients undergoing PCI as compared to high BMI. Study showed that as BMI increased from <20 to 35 kg/m2, there was statistically significant linear reduction in 12 months MACE (21.4% vs. 11.9%, p=0.008) and mortality (7.6% vs. 2.0%, p=0.001). [9]

In emergency department patients with suspected ACS, initial blood glucose levels seem to be an important risk factor for an adverse clinical cardiac event (MACE). [10,11]

A MACE occurred within 30 days of presentation in 15.3% of patients whose emergency admission blood glucose levels have been below 7 mmol/L (about 126 mg/dL), according to data from 1708 Australian and New Zealand patients in a prospective study; however, a MACE occurred in two times as many patients (30.9%) whose blood glucose levels were above 7 mmol/L during that period. [11]

According to He PY et al., the BMI "obesity paradox" was not observed in patients aged 75 and up, suggesting that BMI may not be a sensitive predictor of vascular events in the elderly. At 30 days, patients with a BMI of 30 kg/m^2 had a significantly lower risk of the primary endpoint (HR 0.64; 95 percent CI 0.51 to 0.81, p0.0001) than those with a BMI of 25 kg/m^2.

After the acute phase of 30 days, a landmark study from 30 days to 1 year revealed no change in risk between BMI groups (HR 1.09; 95 percent CI 0.92 to 1.29, p=0.34). [7]

MATERIALS AND METHODS:

This prospective cohort study was conducted at the Punjab Institute of Cardiology, Lahore from August 2020 to February 2021. Total 120 patients with ACS were enrolled by non-probability consecutive sampling technique. Patients were divided into two groups; group-A with raised BMI (BMI >23kg/m^2) and group-B with non-raised BMI (<23kg/m^2) undergoing PCI for ACS. Both male and female patients of ACS undergoing PCI, aged 20-60 years were included in the study. Patients with history of previous percutaneous PCI or cardiac surgery, patients with dilated or hypertrophic cardiomyopathy as indicated by echocardiography were excluded from the study. Written informed consent from all patients of ACS undergoing PCI were taken. PCI was performed according to current standard guidelines, it is a non-surgical invasive therapy aimed at relieving coronary artery constriction or blockage and improving blood flow to ischemic tissue. MACE was recorded (within 3 months death, myocardial infarction, stroke, hospitalization because of heart failure and revascularization) after 3 months of clinical follow-up after patients used standardized protocol that included outpatient visits, and telephone contact for current cardiac events. The data was analyzed using SPSS 25. Post-stratification, RR (Relative Risk) was calculated to check the association. A p-value ≤0.05 was considered statistically significant.

RESULTS:

Total 120 (60 raised BMI / 60 non-raised BMI) patients with ACS were selected for this study. Among raised BMI group, mean age was 37.9±9.3 year and 39.5±8.2 years among non-raised BMI group. Among group-A, there were 32(53.3%) males and 28(46.7%) females, while 37(61.7%) males and 23(38.3%) females among group-B. (Table 1)

According to age distribution in group-A, 23(38.3%) were in 18-30 years, 22(36.7%) in 31-45 years and 15(25.0%) were >45 years while in group-B, 9(15.0%) were in 18-30 years, 28(46.7%) in 31-45 years and 23(38.3%) were >45 years. According to hypertension distribution amongst

Table 1. Distribution of age, gender and risk factors in raised BMI and non-raised BMI groups

Variable		Raised BMI (Group-A)	Non-raised BMI (Group-B)
Age	18-30 years	23(38.3%)	9(15.0%)
	31-45 years	22(36.7%)	28(46.7%)
	>45 years	15(25.0%)	23(38.3%)
Gender	Male	32(53.3%)	37(61.7%)
	Female	28(46.7%)	23(38.3%)
Hypertension		21(35.0%)	25(41.7%)
Smoking		15(25.0%)	21(35.0%)
Diabetes mellitus		26(43.3%)	27(45.0%)
MACE		5(8.33%)	10(16.66%)

Table 2: Age, Gender, Risk factors and MACE correlation

		MACE	Raised BMI (Group-A)	Non-raised BMI (Group-B)	P-Value	Risk Ratio
Age	18-30 years	Yes	0/23 (0%)	1/9 (11.1%)	0.10	1.00
	31-45 years	Yes	3/22 (13.6%)	4/28 (14.2%)	0.94	1.20
	>45 years	Yes	5/25 (20%)	2/13 (15.3%)	0.51	1.37
Gender	Male	Yes	4/32 (12.5%)	8/37 (21.6%)	0.31	0.67
	Female	Yes	1/28 (3.5%)	2/23 (8.6%)	0.43	0.59
Hypertension	Hypertensive	Yes	5/21 (23.8%)	7/25 (28%)	0.74	0.88
	Non-hypertensive	Yes	0/39 (0%)	3/35 (8.5%)	0.06	0.62
Smoking	Smoker	Yes	5/15 (33.3%)	6/20 (30%)	0.90	1.16
	Non-Smoker	Yes	1/45 (2.2%)	4/39 (10.2%)	0.12	0.35
Diabetes mellitus	Diabetic	Yes	5/26 (19.2%)	6/27 (22.2%)	0.78	0.90
	Non-diabetic	Yes	0/34 (0%)	4/33 (12.1%)	0.06	0.6

group-A, 21(35.0%) were hypertensive, and among group-B, 25(41.7%) were hypertensive. According to smoking distribution among group-A, 15(25.0%) were smokers, and among group-B, 21(35.0%) were smokers. According to diabetes distribution among group-A, 26(43.3%) were diabetic, and among group-B, 27(45.0%) were diabetic. (Table 1)

By comparing MACE between groups, it was found that percentage of MACE was 8.3% with group-A and 16.7% with group-B. The difference was insignificant (p=0.168) with risk ratio as 0.636.

Results of the study showed that age group 18 to 30 years age group participants are not on risk whereas, the age increase 31 to 45 years age groups participants were 20% on risk and age group greater than 45 was 37% on risk. Gender and diabetes mellitus had an equal chance of risk, positive history of hypertension has a greater risk than no history of hypertension, smokers had a 16% greater risk than nonsmokers. (Table 2)

DISCUSSION:

The study's goal was to see if there was a link between increased BMI and MACE following PCI in ACS patients. ACS patients have been shown to have an "obesity paradox" in previous research. 12 According to the "obesity paradox" claims that as MACE rate has decreased as increased BMI, Conversely, BMI is not a risk factor for coronary artery disease. Patients with ACS who had primary or elective PCIs showed this pattern.[13] When compared to younger individuals, older adults have very distinct BMI profiles. They held a substantially lower proportion of their weight as fat if they were the same mass as younger patients.

In a multivariate analysis, however, only older age (rather than a higher BMI) has been the best estimate of mortality at one year. People in their eighties and nineties are more likely to be underweight or average weight, younger people are much more likely to be "fat".

Regardless of treatment, older patients had more adverse cardiovascular events than younger patients.[14] As a result, the improved outcomes in individuals with high BMIs could be attributed to their youth.

According to Diercks et al., obese patients with the acute coronary syndrome were more likely to receive medical intervention than normal-weight and underweight patients, and reducing health events are far less common in these patients. [15] According to Steinberg et al., there is a direct link between greater use of guideline-based drugs and rising BMI values in CAD patients. [16] As a result, factors like age or drugs could cause the "obese paradox" to be misinterpreted.

The composition of ACS patients in China differs from that of ACS patients in the West. Over 70% of patients in the United States and Europe are overweight or obese, whereas only 30% of patients have a BMI of normal or lower. [17] As BMI increased, several risk variables remained the same. [18]

In patients who received primary PCI, there is a connection among BMI and clinical effects, which was recently studied, and it was discovered that obese individuals had better outcomes due to their superior renal function. Since different studies disagree on the relationship between BMI and newly emergent cardiovascular events. [19]

According to the study, BMI possibly isn't a strong prophecy of MACE. BMI's weakness is that it can't tell the differentiation between extra body fat and lean muscle mass. Higher body fat mass was unfavorable, whereas better fitness and exercise were linked to greater lean mass ability. As a result, BMI may not be an accurate predictor of obesity. [20] Another study found that patients having PCI who had a low BMI had a big risk of severe cardiovascular events and death than those who had a high BMI. MACE was shown to be reduced in a statistically significant linear manner in the study. (21.4 percent vs. 11.9 percent, p=0.008) and mortality (7.6% vs. 2.0 percent, p=0.001) as BMI climbed from 20 to 35 kg/m^2. [8]

According to a study by Liu X et al., the normal BMI group had MACE at a rate of 16.95 percent, while the overweight group had MACE at a rate of 2.90 percent.[7] According to He PY et al., the BMI "obesity paradox" was not observed in patients aged 75 and up, suggesting that BMI may not be a sensitive predictor of unfavorable cardiovascular events in the elderly.[4] Those with a BMI of 30 kg/m^2 had a decreased risk of the primary endpoint at 30 days (HR 0.64; 95 percent CI 0.51 to 0.81, p0.0001) than patients with a BMI of 25 kg/m^2. After the acute phase of 30 days, a landmark study from four weeks to a year revealed no change in risk among BMI groups (HR 1.09; 95 percent CI 0.92 to 1.29, p=0.34). 7 BMI >25 kg/m^2 had low specificity for detecting extra body fat, according to Romero Corral et al.[21] Waist circumference and waist-hip ratio, on the other hand, were more indicative of lipid levels, as well as sensitive and reliable predictors of acute and prolong cardiovascular events.[22] Underweight patients have a huge risk of heart failure and mortality, which we suspected was due to a low lean mass value, but this needed to be proven.[23]

CONCLUSION:

Obesity has been associated with cardiovascular events. Patients with raised BMI undergoing PCI after ACS had lower in-hospital complications, 3-month MACE, and death after PCI than those with normal or low BMI, a phenomenon called "obesity paradox". BMI is not a very good predictor of body fat. This might be due to super renal functions in obese patients. More research is needed to better understand obesity and its processes, including more obesity indices and biomarkers.

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