



INFLUENCE OF BODY MASS INDEX ON OUTCOME IN PATIENTS UNDERGOING PERCUTANEOUS CORONARY INTERVENTION DURING TWENTY FOUR HOURS OF HOSPITAL STAY

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Author's Contribution

AT:Conducted the study and wrote the article. AMA:Helped in review the article. FN:Re-arranged data and corrected article. ASH:Tables and figures. AN made corrections and did the proof reading.

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ABSTRACT:

BACKGROUND: The influence of obesity on the outcome of coronary interventions is unclear. In different studies obesity paradox has been shown. The study was design to see the frequency of complications after coronary interventional procedure among patients with different body mass index during first day of post procedure hospital stay.

MATERIAL AND METHODS: Three hundred and thirty five patients who underwent percutaneous coronary intervention (PCI) were enrolled. The height and weight of enrolled subjects were measured. The patients were then grouped into three groups according to body mass index (BMI). In Group A the patients were having BMI of less than 24.9, Group B included patients with BMI between 25-30, while in Group C the patients were having BMI of more than 30. The patients remained admitted for 24 hours after PCI and were monitored for major bleeding, myocardial infarction and mortality.

RESULTS: Group A included 72 patients while Group B had 141 patients and in Group C there were 122 patients. Bleeding complications including gum bleed, hematoma at puncture site and anginal symptoms were comparable in all the three groups. Two patients presented with acute stent thrombosis; one each in group A (1.4%) and group B (0.7%). Mortality occurred in 2 patients; one each in group A (1.4%) and group C (0.8%). These observations showed no statistical importance.

CONCLUSION: Obese, overweight and normal weight patients undergoing percutaneous coronary intervention usually have similar outcomes during hospital stay with non-significant increase in complications in normal weight individuals.

KEY WORDS: Body mass index, Obesity, Percutaneous Coronary Intervention, complications.

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INTRODUCTION:

In general, it is observed that coronary artery disease develops more frequently in overweight and obese individuals with consequent mortality.¹⁻³ On the contrary different studies have shown decreased rate of complications in overweight individual.⁴⁻⁹ This controversy is labeled as "obesity paradox". A meta-analysis⁸ showed a relative increase risk of complication after PCI in patients with BMI less than 20 kg/m², while it was also reported that the patients having BMI between 25-30 kg/m² had low risk of post interventional complications and patients with severe obesity with BMI more than 35 kg/m² showed increased complications rate.

It is reported in previous studies that complications like stent thrombosis, stroke, myocardial infarction (MI), bleeding and death may occurred after PCI.¹⁰⁻¹² Out of these complications, bleeding is most commonly reported which may be associated with renal derangement and hypotension. Mostly bleeding occurred at the access site.¹³ A study by Gruberg L et al⁶ showed more vascular / bleeding complications and renal insufficiency in normal BMI group. MI was reported to occur equally in all the three groups. The present study was planned to determine the frequency of different grades of BMI in patients undergoing PCI and its influence on complications during hospital stay.

MATERIALS AND METHODS:

This observational, cross sectional study was carried out at Punjab Institute of Cardiology, Lahore over a period of six months in 2011. The sample size of 335 cases was determined with confidence interval of 95% with 2% margin of error and taking expected bleeding percentage as 3.1 % (least among all) in obese group (BMI > 30) in patients undergoing PCI. Non-probability consecutive purposive sampling was utilized. Patients from 18-70 years regardless gender who underwent elective PCI were enrolled. Patients with history of previous CABG or intervention, having anemia defined as Hemoglobin less than 10 g/dl and renal derangement defined as serum creatinine more than 2.5 mg/dl, stroke, and with bleeding diathesis were excluded. The socio-demographic data including age, gender etc., history and physical examination, and risk factors for CAD including smoking, hypertension, diabetes mellitus, family history of CAD and lipid abnormalities were noted. The height / weight of enrolled subjects were measured. The patients were then grouped into three groups according to body mass index (BMI). In Group A the

patients were having BMI of less than 24.9, Group B included patients with BMI between 25-30, while in Group C, patients were having BMI of more than 30. The patients remained admitted for 24 hours after PCI and were monitored for major bleeding, myocardial infarction and mortality. Complete blood count (CBC), renal function tests, coagulation profile, cardiac biomarkers, hepatitis B and C viral serology were done prior to procedure and 12 hours after the coronary intervention.

The procedural details were also recorded. Patients were followed during their hospital admission for complications like myocardial infarction with raised cardiac bio-marker, bleeding including hematoma at access site, gum bleeding etc., changes on ECG, need for repeat angiography, stent thrombosis and death.

Patients without complications were discharged after 24hrs and those with complications were kept in hospital until they were stabilized.

SATISTICAL ANALYSIS:

Version 15 of SPSS was used to analyze the data. Variables like BMI and age were presented as mean \pm standard deviation. Frequency tables were made to represent predisposing factors for ischemic heart disease. Variables such as gender, procedural and baseline characteristics, vascular complications like hematoma were presented as frequency and percentages. Baseline characteristics and complications during hospital stay in three BMI groups were compared using chi square test. Continuous variables were compared using Anova T test.

RESULTS:

From April 2011 to October 2011, 335 patients

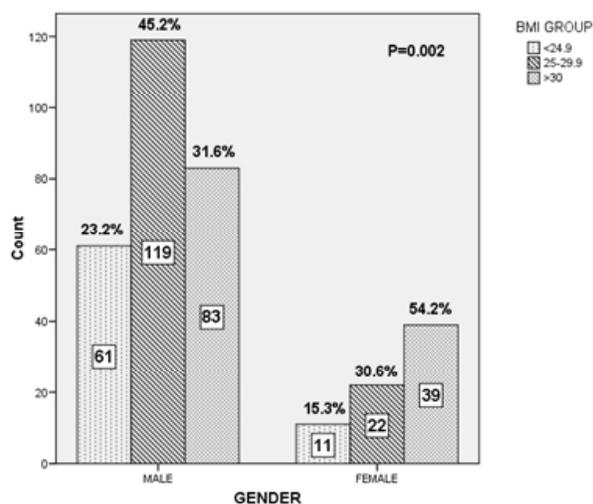


Figure-1: BMI in both genders



Table-1: Demographic features

Variables	Groups			Total n=335	p value
	A n=72	B n=141	C n=122		
Age (mean±SD)	53.04 ± 8.9	52.38± 9.1	51.98±9.6	52.38±9.3	0.73
Gender	Male	61 (84.7%)	119 (84.4%)	83 (68%)	0.002
	Female	11 (15.3%)	22 (15.6%)	39 (32%)	
Smoking	27 (37.5%)	56 (39.7%)	34 (27.9%)	117 (34.9%)	0.12
Diabetes Mellitus	27 (37.5%)	48 (34.0%)	47 (38.5%)	122 (36.4%)	0.73
Hypertension	37 (51.4%)	80 (56.7%)	72 (59%)	189 (56.4%)	0.58
Previous diagnosis of CAD	14 (19.4%)	40 (28.4%)	39 (32%)	93 (27.8%)	0.17
Family History	22 (30.6%)	72 (51.1%)	55 (45.1%)	149 (44.5%)	0.017
Dyslipidemia	13 (18.1%)	22 (15.6%)	32 (26.2%)	67 (20%)	0.08

Table-2: Laboratory Data before procedure

Characteristic	Groups			Total n=335	p value
	A n=72 (mean±SD)	B n=141 (mean±SD)	C n=122 (mean±SD)		
Hemoglobin (g/L)	135.2 ± 15.4	137.3 ± 14.8	132.6 ± 15.0	135.2 ± 15.1	0.04
S/Urea (mg/dl)	28.8 ± 12.5	30.6 ± 20.4	28.3 ± 9.4	29.4 ± 15.5	0.45
S/Creatinine (mg/dl)	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.25	0.33
S/Glucose (mg/dl)	144.1 ± 71.7	149.5 ± 81.0	144.3 ± 72.6	146.5 ± 75.9	0.82
S/Na ⁺ (mmol/L)	140.9 ± 4.2	141.7 ± 3.8	141.2 ± 4.9	141.3 ± 4.3	0.45
S/K ⁺ (mmol/L)	4.0 ± 0.4	3.9 ± 0.4	3.9 ± 0.3	3.9 ± 0.4	0.4
CKMB (U/L)	23.8 ± 21.4	21.6 ± 13.1	27.8 ± 43.6	24.3 ± 29.4	0.2
LV EF (%±SD)	53.1 ± 7.7	53.8 ± 9.1	53.9 ± 8.5	53.7 ± 8.6	0.83

Table-3: Procedural Characteristics:

Characteristic	Groups			Total n=335	p value
	A n=72	B n=141	C n=122		
Intervened vessel	LAD	28 (38.9%)	57 (40.4%)	53 (43.4%)	0.25
	LCX	10 (13.9%)	12 (8.5%)	19 (15.6%)	
	RCA	18 (25%)	31 (22%)	26 (21.3%)	
	OM/Diagonal	1 (1.4%)	7 (5%)	4 (3.3%)	
	LAD + RCA	6 (8.3%)	12 (8.5%)	3 (2.5%)	
	LAD + LCX	0 (0%)	8 (5.7%)	3 (2.5%)	
	RCA + LCX	5 (6.9%)	6 (4.3%)	4 (3.3%)	
	Three vessel	4 (5.6%)	8 (5.7%)	10 (8.2%)	
Type of Stent	DES	49 (68.1%)	107 (75.9%)	99 (81.1%)	0.2
	BMS	23(31.9%)	34(24.1%)	23 (18.9%)	
Procedure time in min. (mean±SD)	64.1±32.6	66.4±33.3	61.9 ± 29.5	64.3 ± 31.8	0.51

undergoing PCI in Punjab Institute of Cardiology, Lahore were included. Males were 263(78.5%) and 72(21.5%) were females. Group-A included 72 patients (BMI<24.9), group-B consisted of 141 patients (BMI 25-30) while group-C had 122 patients (BMI>30). All the three groups matched regarding mean age and risk factor for coronary artery disease. It was observed that females were more obese (54.2% Vs 31.6%). (Fig-1, Table-1). Group-B

TABLE- 4: Complications after PCI

Complications	Groups			Total n = 335	p value
	A n=72	B n=141	C n=122		
Puncture site Hematoma	1 (1.4%)	2 (1.4%)	1 (0.8%)	4 (1.2%)	0.89
Gum Bleeding	3 (4.2%)	3 (2.1%)	3 (2.5%)	9 (2.7%)	0.67
CKMB Elevation	1 (1.4%)	1 (0.7%)	0 (0%)	2 (0.6%)	0.46
Symptomatic Patients	4 (5.6%)	3 (2.1%)	3 (2.5%)	10 (3%)	0.34
New ECG changes	4 (5.6%)	0 (0%)	1 (0.8%)	5 (1.5%)	0.005
Repeat angiograms	1 (1.4%)	1 (0.7%)	0 (0%)	2 (0.6%)	0.46
Stent Thrombosis	1 (1.4%)	1 (0.7%)	0 (0%)	2 (0.6%)	0.46
Death	1 (1.4%)	0 (0%)	1 (0.8%)	2 (0.6%)	0.42

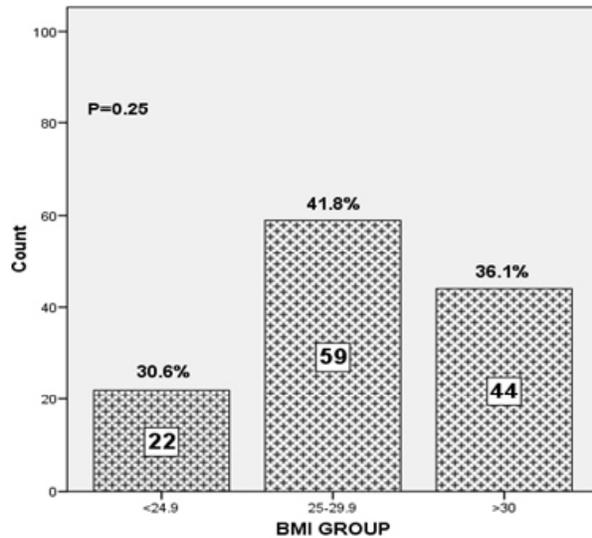


Figure- 2: Proximal segment LAD disease in three BMI groups

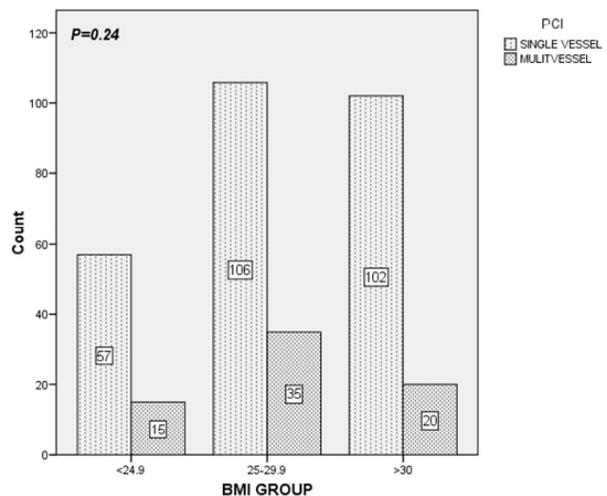


Figure-3: Number of vessels in which intervention was done

(51.1%) as well as group-C (45.1%) patients had more frequency of family history of ischemic heart disease when compared with group-A (30.6%), p=0.017. Laboratory data before intervention was similar in all groups (p=0.04) Table-2. The disease



of proximal segment of LAD and its frequency was equal in all the groups (Figure-2). Majority of the patients who underwent PCI were deployed with drug eluting stents (DES) i.e. group-C (81.1%), group-B (75.9%) and group-A (68.1%). Procedural success was also equivalent in all the three groups. Complications were more observed in group-A (Table-3,4). Similarly ECG changes were more seen in group-A ($P = 0.005$).

DISCUSSION:

We found that most of the patients in our study population had their BMI in the range of 25-30 and frequency of PCI related complications was similar across different grades of BMI. Multiple previous researches have shown that complications after PCI are more common in less body weight patients. Some latest studies have shown controversial observations regarding BMI and PCI. A study by Gruberg L et al⁶ showed more vascular / bleeding complications and renal insufficiency in normal BMI group. MI was reported to occur equally in all the three groups.

Gurm HS et al⁵ analyzed approximately 2000 patients who underwent PCI and showed that complications after the procedure during hospital stay were more frequent in patients with BMI less than 20 kg/m² (5.6%) while their data showed a 2.1% frequency of complication in patients with BMI more than 35 kg/m². From his study, it can be concluded that each unit score rise in BMI is associated with 5.5% lower risk of complication during hospital stay. They suggested this likely improvement due to large vessel caliber and favorable artery/device ratio. They also showed that patients with less BMI used to have small caliber coronary arteries and

thereby increased risk of complication including local access site and coronary complications.

On the contrary, a PCI trial¹⁴ showed one year outcome in post PCI patients and it was suggested that cardiovascular complications are higher in patients with BMI more than 25 (14.5% vs 8.7%, p -value 0.01). BMI can be a predictor of stent thrombosis (hazard ratio 1.47, 95% confidence interval 1.02 to 2.14, $p = 0.04$) and it was also shown in this trial that obese patients were more prone to stent thrombosis but in long term follow-up cardiovascular mortality was more in normal BMI patients.¹⁵

Different studies have shown improved survival rates in patients with high BMI and indicate obesity paradox¹⁴⁻¹⁶. Akin I et al, in his study on patients with PCI having DES implantation found equal rates of all caused mortality in different groups according to BMI.¹⁷ A Russian study reported, females have high BMI as compared to males.¹⁸ In a Brazilian study physical inactivity and obesity were equal in both genders.¹⁹ Obesity, being a chronic inflammatory condition, has the potential to result in anemia; although this viewpoint is controversial.²⁰⁻²¹ We found that patients with increased BMI have more frequently family history of CAD ($p=0.02$). A suggested explanation for this is obesity which leads to increased frequency of coronary artery disease runs in families.

CONCLUSION:

Overweight, obese and normal weight patients undergoing percutaneous coronary intervention usually have similar outcomes during hospital stay with mild increase in complications in normal weight individuals.



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