

Research Article,

Association between Body Mass Index (BMI) and Severity of Coronary Artery Disease in Young Onset Acute Coronary Syndrome (ACS)

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Abstract:

Background:

A high body mass index (BMI) is seems to be associated with an increased incidence of coronary artery disease. If the affected person is young, the consequences are more tragic. There are variable information on the relation of incidence and severity of coronary artery disease in high BMI populations. We have examined the association between BMI and severity of coronary artery disease in young onset Acute Coronary Syndrome (ACS).

Methods:

In this prospective observational study a total number of 150 patients, aged ≤ 45 years presented with acute coronary syndrome were enrolled to analyze association between Body Mass Index (BMI) and severity of coronary artery disease.

Results:

The mean BMI in male was 24.6 ± 3.6 and the mean BMI in female was 25.4 ± 3.3 . Among the 150 patients, 2(1.3%) was underweight, 78(52%) was normal, 60(40%) was overweight & 10(6.7%) was obese. All underweight patients were diagnosed as STEMI. Among the normal BMI patients, 18(23.1%) had UA, 12(15.4%) had NSTEMI & 48 (61.5%) had STEMI. Among the overweight patients, 23(38.3%) had UA, 9(15%) had NSTEMI & 28(46.7%) had STEMI. And among the obese patients, 4(40%) had UA, 1 (10%) had NSTEMI & 5(50%) had STEMI. Considering involving coronary artery, left main coronary artery involvement was 0(0%), 6 (7.7%), 5 (8.3%) & 0(0%) in underweight, normal, overweight & obese patients respectively. Left anterior descending coronary artery involvement was 2(100%), 54 (69%), 45 (75%) & 7 (70%) in underweight, normal, overweight & obese patients respectively. Left circumflex coronary artery involvement was 1(50%), 33 (42%), 25 (41.7%) & 1 (9%) in underweight, normal, overweight & obese patients respectively. And right coronary artery involvement was 1(50%), 35 (44.9%), 31 (51.7%) & 5 (50%) in underweight, normal, overweight & obese patients respectively. In underweight patients 1(50%) had SVD and 1 (50%) had TVD. In normal BMI patients 40 (51.3%) had SVD, 11(14.1%) had DVD and 19 (24.4%) had TVD. In overweight patients 27 (45%) had SVD, 15 (25%) had DVD and 13 (21.7%) had TVD. And in obese patients 5 (50%) had SVD, 3(30%) had DVD and 0 (0%) had TVD. In all BMI group SVD was more common.

Conclusion:

There is no statistically significant differences in severity of coronary artery in respect to body mass index (BMI), in patients presented with acute coronary syndrome.

Key words: Body mass index (BMI), Acute Coronary Syndrome (ACS), Young Adults.

Introduction:

Overweight and obesity are increasingly globally. Many Asian populations used to be physically active with a low body mass index (BMI), but the region now has some of the world’s highest rates of obesity. There is growing concern about the impact of the increasing prevalence of obesity on the burden of coronary heart disease (CHD) [1] Excess adiposity is associated with a variety of health risks, including an increased incidence of cardiovascular events [2-4]. To facilitate clinical decision-making and public health interventions, standard body mass index (BMI; weight (kg)/height (m)²) thresholds have been established to define overweight (BMI 25–<30) and obesity (BMI-30 or more). Cardiovascular risk factors including hypertension, diabetes, tobacco use, dyslipidaemia, and overweight are traditional. Overweight/Obesity has been associated with an increased risk of developing CAD and mortality. Thus, it may be speculated that overweight/obese patients should have worse outcomes than their non-obese counterparts; however, recent publications have suggested that obesity may actually be associated with better outcomes in patients with CAD undergoing revascularization procedures [5] several prospective studies of BMI and CVD risk have been conducted in Asians showing conflicting results [6-8]. The objective of this study to evaluate relationship between BMI & Acute Coronary Syndrome in younger age group. The age cut of 45 years to define a young CAD was selected in this study. The cut off age of 45 has been used in most studies to define young patients with CAD or MI and this same age was used in this study [9-11]

Methodology:

This prospective observational study was done at National Heart Foundation Hospital & Research Institute, Dhaka, Bangladesh. Total 150 patients (male 110 & female 40) aged ≤45 years admitted with acute coronary syndrome was considered as the study population. Meticulous history was taken, examined the patient carefully and necessary lab investigations were done. Height (cm) & weight (Kg) was measured and BMI

(Kg/m²) was calculated in each patients. Based on BMI patients was grouped in four- Underweight (BMI <18.5), Normal (BMI 18.5-24.9), Overweight (BMI 25-29.9) & Obese (BMI 30 or greater). After coronary angiogram, findings of involved vessel, site of lesion, percentage of stenosis was noted. Patients were followed up throughout their hospital stay up to discharge and occurrence of complications, if any was noted.

Results:

The mean BMI in male was 24.6±3.6 and the mean BMI in female was 25.4±3.3, which was not statistically significant. (Table I)

Table I: Distribution of BMI in between gender (N=150)

BMI	Male (n=110)		Female (n=40)		P value
	Mean	SD	Mean	SD	
	24.6	±3.6	25.4	±3.3	.216 ^{NS}

Among the 150 patients, 2(1.3%) was underweight, 78(52%) was normal, 60(40%) was overweight & 10(6.7%) was obese. (Figure 1)

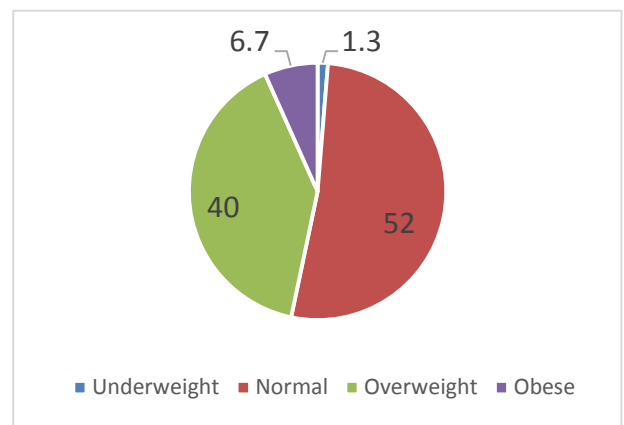


Figure 1: Pie chart showing number of BMI groups.

All underweighted patients were diagnosed as STEMI. Among the normal BMI patients, 18(23.1%) had UA, 12(15.4%) had NSTEMI & 48 (61.5%) had STEMI. Among the overweight patients, 23(38.3%) had UA, 9(15%) had NSTEMI

& 28(46.7%) had STEMI. And among the obese patients, 4(40%) had UA, 1 (10%) had NSTEMI &

5(50%) had STEMI. (Figure 2)

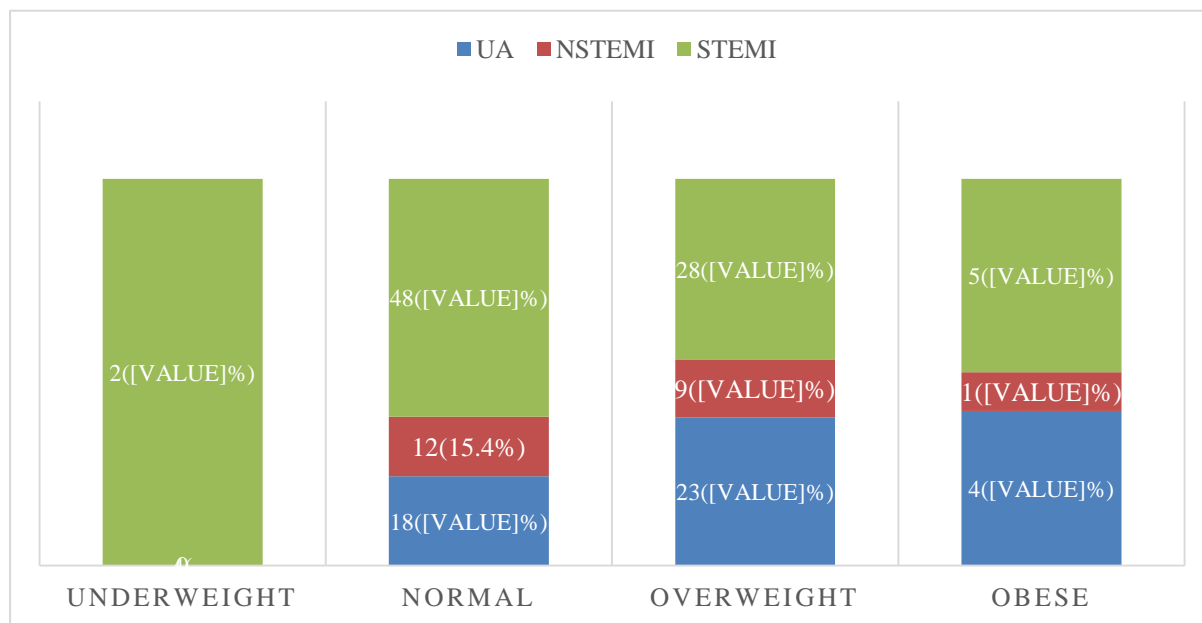


Figure 2: Bar diagram showing clinical diagnosis in BMI groups.

Considering involving coronary artery, left main coronary artery involvement was 0(0%), 6 (7.7%), 5 (8.3%) & 0(0%) in underweight, normal, overweight & obese patients respectively. Left anterior descending coronary artery involvement was 2(100%), 54 (69%), 45 (75%) & 7 (70%) in underweight, normal, overweight & obese patients respectively. Left circumflex coronary artery involvement was 1(50%), 33 (42%), 25 (41.7%) & 1 (9%) in underweight, normal, overweight & obese patients respectively. And right coronary artery involvement was 1(50%), 35 (44.9%), 31 (51.7%) & 5 (50%) in underweight, normal, overweight & obese patients respectively. (Table II)

In underweight patients 1(50%) had SVD and 1 (50%) had TVD. In normal BMI patients 40 (51.3%) had SVD, 11(14.1%) had DVD and 19 (24.4%) had TVD. In overweight patients 27 (45%) had SVD, 15 (25%) had DVD and 13 (21.7%) had TVD. And in obese patients 5 (50%) had SVD, 3(30%) had DVD and 0 (0%) had TVD. In all BMI group SVD was more common. (Figure 3)

Among all 150 patients 3 were died during study period, 2 of there were overweight and 1 was normal BMI.

Table II: Involvement of coronary artery/arteries (N=150)

Variables	Underweigh t (n=2)		Normal (n=78)		Overweigh t (n=60)		Obese (n=10)		p value *
	n	%	n	%	n	%	n	%	
LMCA	0	0	6	7.7	5	8.3	0	0	.788 ^{NS}
LAD	2	100	5	69	45	75	7	7	.781 ^{NS}
LCx	1	50	3	42	25	41.7	1	9	.252 ^{NS}
RCA	1	50	3	44.	31	51.7	5	5	.878 ^{NS}

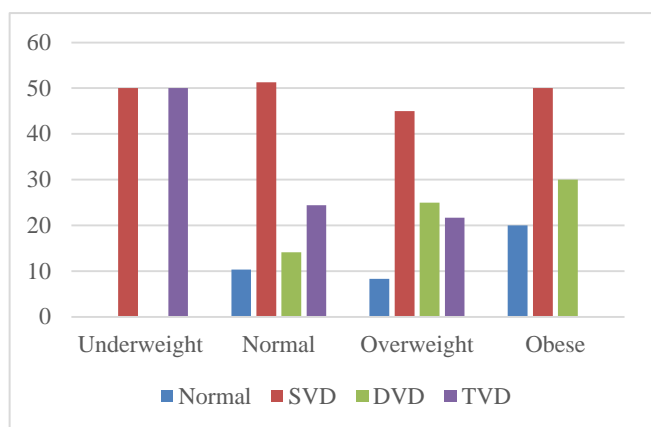


Figure 3: Multiple bar diagram showing number of vessels involvement in BMI groups.

Discussion:

The majority of ACS occurs in individuals > 45 years old. However, 5-10% of myocardial infarctions (MI) occur in patients younger than that. Although ACS in younger patients is generally associated with a favorable prognosis, the personal and societal burden of premature coronary disease is substantial. [12]

Their risk factors vary in different countries. In most studies, smoking is the most prevalent risk factor in young patients. Diabetes, Hypertension, Positive family history of CAD has been important in some studies. In some studies, Obesity, Dyslipidaemia, and high fibrinogen are independent significant coronary risk factors in young patients. [9] Different studies at different countries & centers showing conflicting results regarding relationship between BMI & coronary artery disease. We have tried to evaluate our statistics specially in younger age group. In a Korean study, their data provide strong evidence that the association between BMI and ischemic heart disease is graded throughout the entire BMI range, with no apparent thresholds even at low BMI levels and no indication of a U-shaped relation at low BMI levels. [13]. In a study in Pakistan they found that obesity is associated with less severe coronary artery disease in women population of Pakistani origin. [14]. CHD incidence in women increases progressively with BMI, an association consistently seen in different subgroups. The shape of the relation with BMI differs for incident and fatal disease. [15]. another study finds obesity is strong risk factor in coronary heart disease & mortality especially in women. [16]. But in our study we don't found any statistically significant difference in any aspect of coronary artery disease in younger age group who

presented with Acute Coronary Syndrome.

BMI was positively and roughly linearly related to CHD mortality throughout the BMI range of 20-40, with the lowest risk observed at about 20-22.5. [17-18]. In East Asians, a similar positive association for CHD mortality in the upper BMI range, with the lowest risk noted at the same BMI range of 20-22.4. However, these data did not suggest a dose-response relationship for BMI values above 30 [19]. But in this study we don't get any statistically significant difference in mortality in obese and non obese, based on BMI.

Conclusions:

This study found that only BMI itself is not statistically significant in onset and severity of coronary artery disease and not in mortality rate. Multiple others risk factors like- smoking, diabetes mellitus, hypertension; dyslipidaemia may influence the young onset acute coronary syndrome.

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