ORIGINAL ARTICLE

Frequency of Young Adults and Comparison of High Body Mass Index in Young Vs Old Patients With First Non-St Segment Elevation Myocardial Infarction

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ABSTRACT

Background: Non-ST elevation myocardial infarction (NSTEMI) may be present among young adults and its association with high body mass index (BMI) among young adults with first NSTEMI is not known. No precise data is available in South Asian countries.
Aim: To determine the frequency of young adults among patients presenting with first NSTEMI and to compare the frequency of BMI in young versus old patients with NSTEMI.
Study design: Cross sectional validation survey.
Setting: Emergency department, Punjab Institute of Cardiology, Lahore.
Duration of study: Six months.
Sample size: This study included 300 patients with NSTEMI.
Results: There were 51(17%) young adults and 249 (83%) old age patients. Among 51 patients of young adults group, high BMI was noticed among 41 (80.4%) patients and in old age group, high BMI was calculated in 72 (28.9%) patients ($p<0.05$).
Conclusion: A high frequency of young adults suffered from NSTEMI. High BMI was frequently present among young adults with NSTEMI as compared to old age.
Keywords: Non ST elevation myocardial infarction; young adults; old age; body mass index

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of mortality following ischemic stroke. The annual risk for myocardial infarction following ischemic stroke is approximately 2.2%. [1] By 2020 it is estimated that it will be the major cause of death in all regions of the world. [2]It is estimated to be 6.1% in men and 4.0% in women in Pakistan[3].

Risk factors for CAD are now well recognized and modification of these factors can prevent heart attacks and prolong life. High cholesterol, cigarette smoking, hypertension, positive family history, age and diabetes mellitus are the major risk factors of CAD. Age, male sex and family history are the non-modifiable risk factors. Smoking, hypertension, Diabetes mellitus, sedentary lifestyle, obesity and high cholesterol diet are the modifiable risk factors[4].

Acute coronary syndrome (ACS) represents clinically manifested acute myocardial ischemia. ACS comprises non ST elevation ACS (NSTE-ACS), unstable angina (UA) and ST elevation MI (STEMI). It is important to note that mortality of STEMI and NSTEMI are comparable after six months[5].

The Obesity is a medical condition in which excess body fat accumulates to the extent that it may have an adverse effect on health, leading to reduced life expectancy and it is a complex, multi-factorial chronic disease. [6] Abdominal fat deposition has emerged as strong risk factor for cardiovascular diseases (CVD) and is measured in terms of Waist-Hip Circumference[7,8].

Obesity has turned into a worldwide epidemic. In the last decades the number of obese patients has increased considerably. It is especially alarming that in recent years the increase was most pronounced in children and that it occurs both in developed, but perhaps even more, in developing countries[9]. Visceral obesity leads to insulin resistance in part mediated by adipokines and free fatty acids (FFA)[10]. Obesity, especially central obesity, is probably the main cause of the metabolic syndrome (MetS), which includes insulin resistance, type 2 diabetes mellitus, hypertension, the obstructive sleep apnea syndrome, non-alcoholic fatty liver disease (NAFLD) and dyslipidemia, all risk factors for cardiovascular disease[11,12].

Obesity is defined in terms of body mass index (BMI). The Body mass index (BMI; in kg/m^2) is widely used for the classification of overweight (BMI 25) and obesity (BMI 30) in men and women[13]. BMI correlates reasonably well with laboratory-based measures of adiposity for population studies, and is extremely practical in most clinical settings.

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The Behavioral Risk Factor Surveillance System reported that the prevalence of obesity increased by 24% from 2000 to 2005. However, the prevalence of extreme obesity (BMI>40 kg/m2) increased by 50%[14].

Global trends of increasing obesity threaten public health and contribute to the burden of disease as much as smoking does. Obesity by itself is associated with co morbid cardiovascular risk factors(i.e. hypertension, dyslipidemia, diabetes mellitus) and novel risk factors(e.g. inflammatory markers such as high sensitive-CRP (hs-CRP), interleukin 6 (IL-6) and coronary endothelial dysfunction. These associations with obesity provide a plausible biological link to epidemiological observations that indicate obesity is associated with increased risks of non-fatal and fatal cardiovascular events[15].

Thus clinical detection of obese individuals has reached critical importance. Multiple obesity indices (BMI, waist- hip ratio, waist circumference) are used to define cardiovascular risk in clinical and research settings. Waist-to-hip ratio and waist circumference project only central fat distribution, not whole body fat. Dexa scan and MRI can also be assessed fat distribution but they are expensive[16].

For adults, BMI is commonly used, because it is safe, convenient and projects whole body fat. BMI is determined by using weight and height[17].

A study done by Basoor A showed that among 206 patients with ST segment elevation myocardial infarction, 36 were young. In young patients with myocardial infarction, 78% were obese compared with 35% obese non-young[18] assume in my study the same frequency of high BMI in young patients with non ST elevation myocardial infarction.

A study performed in Korea showed that there was a 14% increased incidence of ischemic heart disease per unit increase in BMI[19].

The rationale of my study is that mostly studies are done on Western population and data from our population is lacking, despite of the fact that obesity is also prevailing in our population. There is increasing trend of non-ST elevation myocardial infarction at young age, but yet no study in Pakistan has assessed the frequency of high body mass index in patients with non-ST elevation myocardial infarction at young age that's why I want to do this study in our population. So my study will play a pivotal role in deviating attention of researcher towards this important issue. It will be inexpensive, cost effective study that ultimately will guide us to plan better preventive measures and reduction of risk factor associated with heart disease.

The objective of the To determine the frequency of young adults among patients presenting with first non-ST elevation myocardial infarction

2) To compare the frequency of high body mass index in young versus old patients with non- ST segment elevation myocardial infarction.

MATERIAL AND METHODS

This cross-sectional survey was carried out in the emergency department, Punjab Institute of Cardiology, Lahore. The sample size of 300 cases is calculated with 5% margin of error, 95% confidence level and taking expected percentage of young adults i.e. 17.5% with non- ST elevation myocardial infarction. Study was conducted from 10th April,2013 to 9th October, 2013. Non-probability purposive sampling technique was used.

Inclusion criteria

- Both genders
- Age: patients of all ages.
- Chest pain of more than 10 minutes, with ST segment depression of more than or equal to 0.5 mm in two consecutive chest or limb leads in ECG and positive troponin– T of value equal to or more than 100pg/ml.

Exclusion criteria

- Patients with ST segment elevation myocardial infarction, assessed on ECG.
- Patients with L.B.B.B, assessed on ECG.
- Patients with unstable angina.
- Patients with renal failure, diagnosed cardiovascular disease, pregnancy, bleeding disorder, organ transplant.

Data collection and analysis procedure: Three hundred patients fulfilling inclusion and exclusion criteria were included from emergency department of Punjab Institute of Cardiology after taking informed consent. Data was analyzed using SPSS version 16.0. Continuous variables like age, BMI values were presented as mean ± standard deviation and categorical variables like gender, young adults and outcome variable i.e. high BMI was presented as frequencies, percentages and graph. Data was stratified for diabetes and hypertension to address effect modifiers. Chi square test was used to compare the frequency of high body mass index in both groups. P value ≤0.05 was considered as statistically significant.

RESULTS

The total number of patients included in the study was 300.The mean age of the patients was 56.27±9.28 years [range 30 - 76 years]. There were 31 (10.3%) patients of age range of 30 – 40 years, 80 (26.7%) patients of age range of 41–50 years, 119(39.7%) patients of age range of 51-60 years, 54(18%) patients of age range of 61–70 year and

16(5.3%) patients of age more than 70 years (Table 1). There were 62 (20.7%) female patients in the study, while 238(79.3%) patients were male. Male to female ratio was 3.83:1 (Fig. 1).Among the 300 patients in the study, there were 51(17%) patients who were labeled as young adults and 249 (83%) patients were labeled as old age (Figure 2).The mean height among young adults was 1.34±0.18 meters and among old age patients was 1.39 ± 0.36 meters. Statistically, there was no significant difference between the two groups (p > 0.05). (Table 3)

The mean weight of patients in young adults group was 77.56±11.36 kilograms and in old age group was 87.39±10.36 kilograms. Statistically, this difference was significant (p<0.05) (Table 2).The mean BMI among young adults group was 31.63±1.61 m2/kg and in old age group was 25.91±1.20m2/kg. Statistically, this difference was significant (p<0.05) (Table 2). Among 51 patients of young adults group, high BMI was noticed among 41(80.4%) patients and in old age group, high BMI was calculated in 72(28.9%) patients. Statistically, this difference was significant (p<0.05) (Table 3). Among 51 young adults, hypertension was present among 7(13.7%) patients. In 249 old age patients, there were 25(10.1%) patients who were found hypertensive. Statistically, this difference was not significant (p> 0.05) (Table 4). Among 51 young adults, diabetes mellitus was present among 4(7.8%) patients. In 249 old age patients, there were 49(19.7%) patients who were found diabetic. Statistically, this difference was not significant (p> 0.05) (Table 4).

Fig.1: Distribution of patients by sex (n=300).

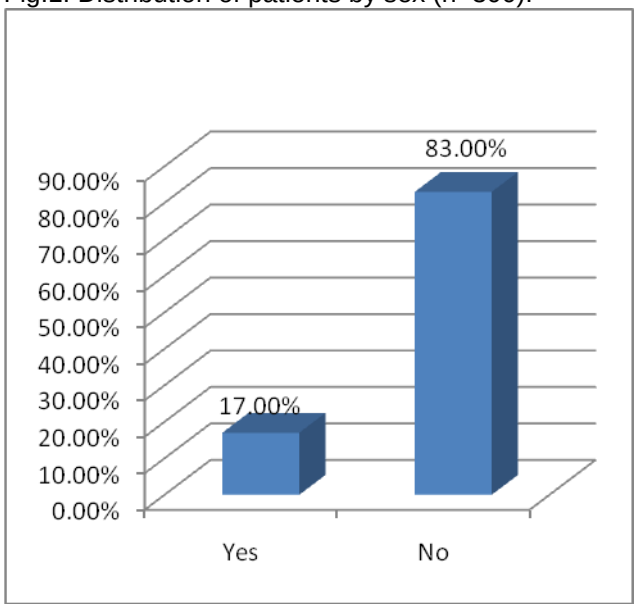

Fig. 2: Distribution of patients by young adults (n=300).

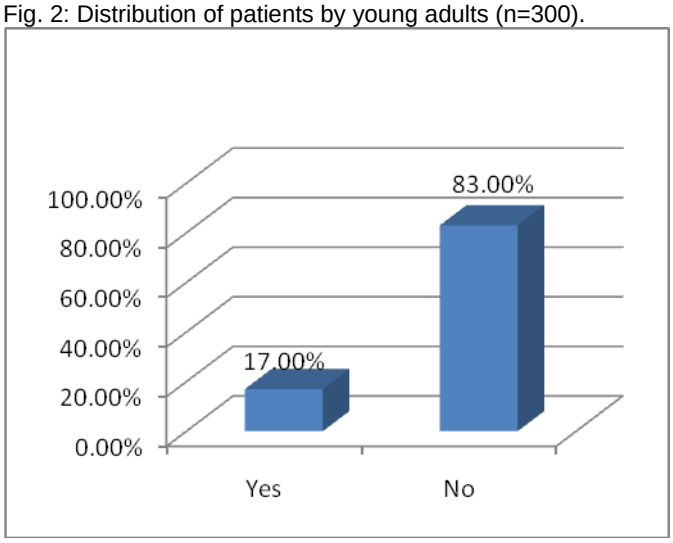

Table 1: Distribution of patients by age (n=300)

Age (years)	n
30-40	31(10.3%)
41-50	80(26.7%)
51-60	119(39.7%)
61-70	54(18%)
> 70	16(5.3%)
Mean ± SD	56.27±9.28
Range	30 – 76

Table 2: Comparison of patients by mean height, weight and BMI in young adults and old age groups.

Age	Height (m) Mean± SD	Weight (kg) Mean + SD	BMI(kg/m^2) (BMI) Mean + SD MI
Young adults (n=51)	1.34±0.18	77.56±11.36	31.63±1.61
Old age (n=249)	1.39±0.36	87.39±10.36	25.91±1.20
p-value	0.931	0.036	0.007

Table 3: Cross tabulation of age groups of the patients with high BMI (n=300).

Age group	High BMI	
	Yes	No
Young adults (n=51)	41(80.4%)	10(19.6%)
Old age (n=249)	72(28.9%)	177(71.1%)

P value* 0.000

Table 4: Cross tabulation of presence of age groups of patients with hypertension and diabetes mellitus (n=300).

Age group	Hypertension		Diabetes mellitus	
	Yes	No	Yes	No
Young adult (n=51)	7(13.7%)	44(86.3%)	4(7.8%)	47(92.2%)
Old age (n=249)	25(10.1%)	224(89.9%)	49(19.7%)	200(80.3%)
P value	0.437		0.759	

DISCUSSION

We conducted this cross sectional study to determine the frequency of population of young adults with high risk patients with NSTEMI. Based upon calculations of BMI, we observed that majority of patients had mild or moderate risk (89.6%). We also observed a high frequency of young adults having first NSTEMI i.e., 17%. The frequency of patients with high BMI was significantly higher among young adults as compared to old age (80.4% versus 28.9%).

Previously, in a large retrospective analysis of 111,847 patients in the CRUSADE initiative, approximately 36% were overweight and approximately 35% were obese. Extremely obese patients (BMI > 40 kg/m^2, approximately 6% of the sample) experienced their first MI on average approximately 16 years earlier than their lean counterparts. After adjustment for potential confounders, the age differential remained substantial at approximately 12 years. Although there were higher rates of almost all cardiovascular risk factors in the obese patients, these were countered with higher rates of prescribed cardioprotective drugs at baseline. A previous CRUSADE study confirmed higher rates of risk factors and prescribed cardioprotective drugs in this patient subset. The investigators reported that obese individuals received more aggressive coronary management, which was associated with improved outcomes[12].

In our study, young adults who suffered from NSTEMI, a higher mean value of BMI was noticed i.e., 31.63±1.61 versus 25.91±1.20 ($p<0.05$). In a study by Madala MC, et al, [14]it was also confirmed that higher BMI reduced the age of first NSTEMI more than any other variable, followed by current smoking, which resulted in a9.7-year-earlier presentation. Our findings are consistent with a previous report in 906 consecutive patients who presented with acute MI and had a 10.6-year age difference between the BMI categories of <25 and >30 kg/m^2.[20]

The analysis from the CRUSADE registry in this issue of the Journal (1) reports a striking, stepwise lower age at first NSTEMI in patients with increasing BMI. Patients admitted with NSTEMI and BMI >40 kg/m2 (extreme obesity) were 15.9 years younger than patients with a first NSTEMI and BMI <18.5kg/m^2 (underweight) or 12.5 years younger than those with a normal weight (BMI 18.6 to 25.0 kg/m^2)[21].

Obesity, particularly in those with excess intra-abdominal adipose tissue, has been postulated to be a cardiovascular risk state mediated through a variety of pathways. Our data suggest that 1 pathway is a central factor in a cluster of elevated risk factors that include hypertension, diabetes, and dyslipidemia. [22] A previous report from the CRUSADE registry found that 89.5% of all patients with NSTEMI had at least 1 traditional cardiovascular risk factor not including obesity. [23] Intra-abdominal adiposity has been associated with elevations in interleukin-6 as well as other cytokines/ adipokines that have been linked to the pathogenesis of atherosclerotic plaque accumulation and rupture. Interleukin-6, produced from adipocytes, is the major stimulus for hepatic production of hsCRP. Approximately 70% of the variation in hsCRP is explained by adiposity along with associated conventional risk factors[24].

A large proportion of the overweight and obese populations are attempting to lose weight. Voluntary weight reduction in multiple studies has been associated with a concomitant decrease in all-cause and cardiac mortality. The explanation for improved outcomes is partly explained by favorable modifications in dietary and exercise habits, reductions in risk factors, increased compliance with cardioprotective medications, or combinations thereof[25].

In our study, hypertension and diabetes mellitus were also assessed as risk factors present in young versus adult population. It was noticed that 13.7% patients of young age group had hypertension and 10.1% patients in old age group had hypertension. So, no significant difference was found between the two groups. Similar was the case with diabetes i.e., 7.8% young patients had DM and 19.7% patients in old age group had DM.

In our study, the frequency of NSTEMI among young adults was 17% and the mean age of the patients was 56.27±9.28 years and 79.3% patients were male. Jamil G, et al, in their study observed that the mean age was 36.4±SD of 4.2 years[26]. 92.6% were male patients. The average Body mass Index of the group was 30.39 kg/m^2. There were 67.6% patients who suffered from NSTEMI while rest of 32.4% suffered from STEMI. The frequency of NSTEMI was high as they included only patients with myocardial infarction in young age and stratified the risk factors.

This study had certain limitations. This was carried out in a single center with a limited population size of patients who presented in a tertiary care center. This was not a representative of who population.

CONCLUSION

The frequency of young adult patients suffering from NSTEMI was found to be high. The mean BMI was

found to be significantly high among those patients as compared to old age patients. Young adult patients presented more frequently with high BMI as compared to old age. So, the young adult patients with high BMI may be at a higher risk of developing NSTEMI. It is recommended that young adult patients with high BMI should be screened for presence of NSTEMI.

REFERENCES

1. Klein LW, Nathan S. Coronary artery disease in young adults. J. Am. Coll. Cardiol 2003;41:529-531.
2. Bloomfield P, Bradbury A, Grubb NR, Newby DE. Cardiovascular Disease. In: Boon NA, Walker BR, Hunter JAA. Davidson's Principles and Practice of Medicine. 20th ed. Edinburgh: Churchill Livingstone 2006;519-646.
3. Jafar TH, Qadri Z, Chaturvedi N. Coronary artery disease epidemic in Pakistan: more electrocardiographic evidence of ischaemia in women than in men. Heart 2008;94:408-413.
4. Almas A, Hameed A, Sultan FA. Knowledge of coronary artery disease (CAD) risk factors and coronary intervention among university students. J Pak Med Assoc 2008;58:553-557.
5. Daga LC, Kaul U, Mansoor A. Approach to STEMI and NSTEMI. JAPI 2011;59:19-25.
6. Rankinen TA, Zuberi.YC, Chagnon SJ, Weisnagel G, Argyropoulos B, Walts L. The Human Obesity Gene Map: the 2005 update. Obesity 2006;14:529-534.
7. Ardern CI, Katzmarzyk PT, Janssen I, Ross R. Discrimination of health risk by combined body mass index and waist circumference. Obes Res 2003;11:135-142.
8. Vrdoljjak D, Bergman Markovic B, Kranjcevic k. How well do anthropometric indices correlate with cardiovascular risk factors? Med Sci Mont 2012;18:6-11.
9. Knight JA. Diseases and disorders associated with excess body weight. Ann Clin Lab Sci 2011;41:107-121.
10. Flock MR, Green MH, Kris-Etherton PM. Effects of adiposity on plasma lipid response to reductions in dietary saturated fatty acids and cholesterol. Adv. Nutr 2011;2:261-274.
11. Boden G. Obesity, insulin resistance and free fatty acids. Curr. Opin. Endocrinol. Diabetes Obes 2011:18:139-143.
12. Zalesin KC, Franklin BA, Miller WM, Peterson ED, McCullough PA. Impact of obesity on cardiovascular disease. Med. Clin. North. Am 2011;95:919-937.
13. Ogden CL, Carroll LR, Curtin MA, McDowell CJ. Prevalence of Overweight and Obesity in the United States, 1999-2004. JAMA 2006;295:1549-1555.
14. Mandala MC, Franklin BA, Chen AY, Berman AD, Roe MT. Obesity and age of first non-ST segment elevation myocardial infarction. J Am Coll Cardiol. 2008;52:979-85.
15. Humayoun A, Shah AS. Relation of hypertension with BMI and age in male and female population of Peshawar. J Ayub Med Coll Abbottabad 2009; 21:63—5.
16. Allison H. Christian, Lori J Mosca. Waist circumference, body mass index and their association with cardiometabolic and global risk. Cardiometabolic syndrome 2009;4:145.
17. Shah NR, Braveman ER. Measuring adiposity in patients: The utility of body mass index, percent body fat and leptin 6.
18. Jee SH, Barriuso RP. Body mass index and incident ischemic heart disease in South Korean men and women. American Journal of Epidemiology 2007;162: 42--8
19. Basoor A, Cotant JF, Randhawa G. High prevalance of obesity in young patients with ST segment elevation MI. Am Heart Hosp J 2011; 9:37—40.
20. Suwaidi JA, Wright RS, Grill JP, et al. Obesity is associated with premature occurrence of acute myocardial infarction. Clin Cardiol 2001;24:542–7.
21. Yusuf S, Yawken S, Ounpuu S. Obesity and the risk of myocardial infarction in 27.000 participants from 52 countries: a case-control study. Lancet 2005;366:1640 –9.
22. Roe MT, Halabi AR, Mehta RH. Documented traditional cardiovascular risk factors and mortality in non–ST-segment elevation myocardial infarction. Am Heart J 2007;153:507–14.
23. Miller M, Zhan M, Havas S. High attributable risk of elevated C-reactive protein level to conventional coronary heart disease risk factors: the Third National Health and Nutrition Examination Survey. Arch Intern Med 2005;165:2063– 8.
24. Poirier P, Giles T, Bray G, et al. AHA scientific statement. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. Circulation 2006;113:898 –918.
25. Widlansky ME, Sesso HD, Rexrode KM, Manson JE, Gaziano JM. Body mass index and total and cardiovascular mortality in men with a history of cardiovascular disease. Arch Intern Med 2004;164:2326 –32.
26. Jamil G, Jamil M, AlKhazraji H, Haque A, Chedid F, Balasubramanian M, et al. Risk factor assessment of young patients with acute myocardial infarctionAm J Cardiovasc Dis 2013;3:170-4.