Original Article

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SEVERITY OF CORONARY ARTERY DISEASE IN OBESE PATIENTS UNDERGOING CORONARY ANGIOGRAPHY

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ABSTRACT

Objective: To assess the relationship of severity of coronary artery disease with obesity in patients undergoing coronary angiography.

Design: Cross sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology – National Institute of Heart Diseases (AFIC-NIHD), 1st February 2010 to 31st August 2010

Patients and Methods: The study population included 468 patients undergoing coronary angiography. Obesity was classified according to the BMI using the National Institutes of Health (NIH) criteria as normal (BMI 21–24 kg/m^2), overweight (BMI 25–29 kg/m^2), obesity class I (BMI 30–34 kg/m^2), obesity class II (BMI 35 to 39 kg/m2 and obesity class III (BMI 40 or above kg/m^2).

Coronary angiography data were obtained from the Siemens Queries software system, which maintains the database including detailed angiographic findings of all patients at this institution. Significant lesions were defined as those with >70% diameter narrowing of coronary arteries (>50% for the left main coronary artery). We attempted to quantify the "severity of CAD" by ascertaining the prevalence of High-Risk Coronary Anatomy (HRCA).

Results: Insignificant difference was observed in traditional risk factors i.e. age, diabetes mellitus and smoking except hypertension and gender. Statistically significantly low prevalence of HRCA was encountered in the obese group (57.7%) as compared to normal/overweight group (75.8%) ($p < 0.05$).

Conclusion: We conclude that obesity is associated with less severe coronary artery disease.

Keywords: Coronary angiography, Obesity, severity of coronary artery disease.

INTRODUCTION

Obesity is an increasingly prevalent metabolic disorder affecting not only the US population but also that of the developing world. It is estimated from the third National Health and Nutrition Examination Survey (NHANES III) (1988-1991) that 33% of the US population is obese, compared to 25% in NHANES II (1976-1980)[1]. According to the National Health Survey 2001 the prevalence of obesity in Pakistan for the age group 25 to 64 is 13% for males and 23% for females[2]. There is a growing recognition that obesity adversely influences traditional cardiovascular risk factors such as hypertension, plasma lipids, diabetes mellitus and the metabolic syndrome and therefore the American Heart Association (AHA) defines obesity as a strong risk factor for coronary artery disease (CAD)[3]. Among those with established coronary artery disease, the evidence is somewhat contradictory. A number of studies have suggested an 'obesity paradox' whereby obesity appears to be protective against an adverse prognosis. In a meta-analysis of 10 cohorts of patients undergoing Percutaneous Coronary Intervention (PCI), Oreopoulos et al.[4] demonstrated a lower risk of dying among both overweight and obese patients. Although obesity has been implicated as an independent risk factor for CAD events in the general population, recent evidence has alluded to the presence of an apparent paradoxical relationship between obesity and cardiovascular prognosis in certain subsets of patients. In particular, data indicates that short-term outcomes and survival in patients with heart failure[5] and in patients following coronary revascularization[6-8] appear to be paradoxically better in obese compared to lean patients (obesity paradox). Indeed, the "obesity paradox" theme has generated considerable debate in recent literature;[9] a study from Israel examined the relation between body mass

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index (BMI) and extent of CAD and suggested that obesity be considered a 'negative predictor' of coronary artery disease severity in patients referred for coronary angiography[10]. We attempted to explore this hypothesis in the Pakistani population.

Objective

The objective of our study was to assess the relationship of severity of coronary artery disease with obesity in patients undergoing coronary angiography.

METHODOLOGY

This study was carried out at AFIC/NIHD Rawalpindi between February 2010 and August 2010. All the patients undergoing coronary angiography were included in the study. Patient demographics and medical history including cardiovascular risk factor profile (age in years, gender, diabetes mellitus as per WHO criteria[11], hypertension per Joint National Committee 7 criteria[12], cigarette smoking and family history of coronary artery disease) were abstracted from patient charts. Obesity was classified according to the BMI using the National Institutes of Health (NIH) criteria as normal (BMI 21–24 kg/m^2), overweight (BMI 25–29 kg/m^2), obesity class I (BMI 30–34 kg/m2), obesity class II (BMI 35 to 39 kg/m^2 and obesity class III (BMI 40 or above kg/m^2).

The patients under study were divided in two groups. Patients who were of normal weight and overweight were put in one group whereas patients whose weight fell into obesity class I, II and III were put in another group and their severity of coronary artery disease on coronary angiogram was compared. Coronary angiography data was obtained from the Siemens Queries software system, which maintains the database including detailed angiographic findings of all patients at this institution. Significant lesions were defined as those with >70% diameter narrowing of coronary arteries (>50% for the left main coronary artery). We attempted to quantify the "severity of CAD" by ascertaining the prevalence of High-Risk Coronary Anatomy (HRCA).

Statistical Analysis

Statistical analysis was performed using the SPSS 13.0. Descriptive statistics were used to describe the data. Chi square test was applied to compare qualitative variables between the groups. Independent samples' t-test was used to compare age between the groups. A p-value < 0.05 was considered as significant.

RESULTS

Four hudred and sixty eight patients were included in the study. Out of these 364 (77.8%) were normal/overweight while 104 (22.2%) were obese. Average age in normal/overweight group was 55.8 years (SD=6.34) and in obese patients it was 56.6 years (SD=5.17) (p>0.05). Gender description and medical history are given in table 1. There was insignificant difference in the distribution of traditional risk factors like diabetes mellitus and smoking except for hypertension and gender in the obese and non-obese groups of patients (table-1).

Comparing overall obese (BMI ≥ 30) vs. non obese groups, a statistically significant low prevalence of HRCA was encountered in the obese group as compared to normal/overweight patients (57.7% vs 75.8%) (table-2 and figure).

DISCUSSION

Our findings suggest that obese patients being referred for coronary angiography have a paradoxically lower CAD burden compared to their non obese comparators implying the presence of an apparent "obesity paradox".

Obesity has traditionally been considered a cardiovascular risk factor and has been associated with an increased risk of developing CAD and mortality in the general population. Thus, it may be speculated that obese patients should have worse outcomes than their nonobese counterparts; however, recent publications have suggested that obesity may actually be associated with better outcomes in patients with CAD undergoing revascularization procedures[13]. This paradoxical observation relating obesity to better clinical outcome is known as the "obesity paradox" and has also been reported in other

Table-1: Baseline characteristics of patients.

	Normal/over weight (n = 364)	Obesity Class I/II/III (n = 104)	*p*-value
Male	290/364 (79.7%)	50/104(48.1%)	0.0001
Hypertensive	74 (20.3%)	40 (38.5%)	0.0003
Diabetics	70 (19.2%)	22 (21.2%)	0.6757
Smokers	50 (13.7%)	8 (7.7%)	0.1279

Table-2: Comparison of severity of CAD between both the groups.

	Normal/Over weight (n = 364)	Obesity I, II, II (n = 104)
Mild/ Moderate CAD (Normal coronaries/Minor CAD/Subcritical CAD)	88 (24.2%)	44 (42.3%)
Severe CAD (SVCAD/DVCAD/TVCAD)	276 (75.8%)	60 (57.7%)

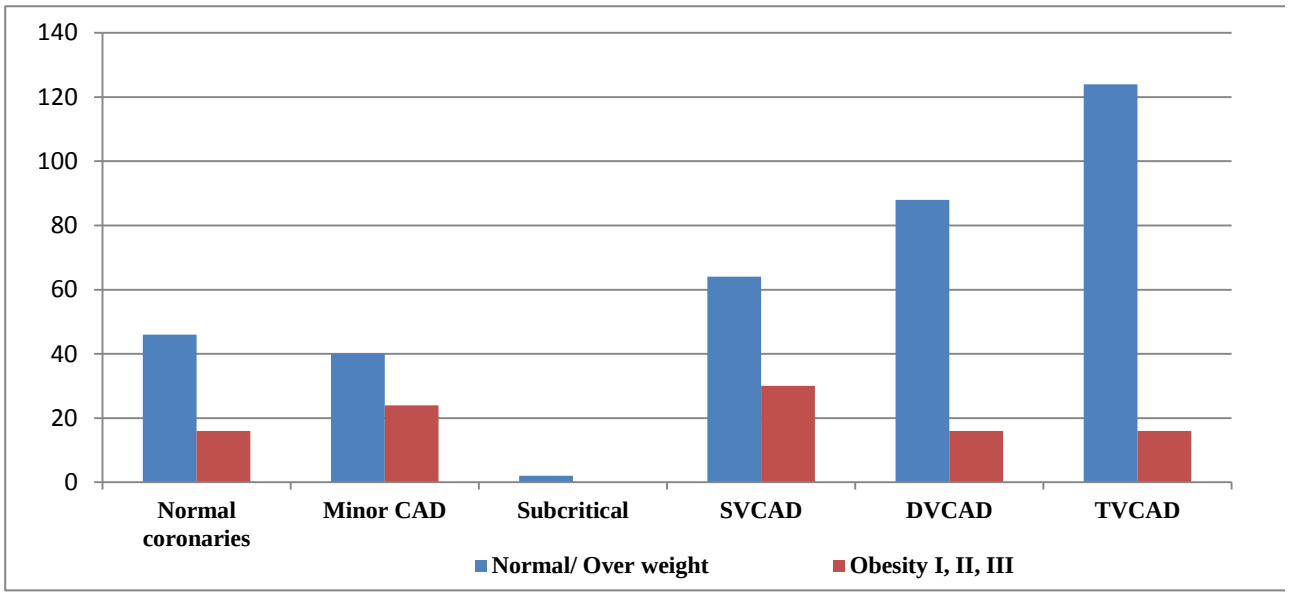

Figure: Description of CAD in both the groups.

cardiovascular diseases including acute coronary syndromes and heart failure[4,5]. A recent study from Israel by Rubinshtein et al.[10] showed that obesity was associated with less severe coronary artery disease among patients undergoing coronary angiography. Obese patients were found to have significantly low prevalence of HRCA (23 % vs. 37%) compared to nonobese comparators. Further, obese patients were referred for coronary angiography at an earlier age than their nonobese counterparts[14].

We noted a trend towards lower mean age for the patients at the time of referral (for angiography), consistently among obese patients. Although obese patients were found to have a lower CAD burden and lesion severity, these findings appear to be mitigated by the fact that obese patients were referred for coronary angiography at an earlier age.

Our observations, although speculative, seem to also implicate the "tendency or bias of physicians" to refer obese patients (particularly those with additional cardiovascular risk factors) for angiography more liberally; the lower threshold for the decision to define coronary anatomy presumably driven by a higher prevalence of pronounced symptomatology, disability, and co-morbidities frequent in overweight patients.

The apparent negative association between obesity and CAD severity found in our study population appears to be mostly a reflection of physician practice patterns, in particular, the fact that obese patients were referred for coronary angiography at a younger age. Being a cohort study from a single institution, cohort selection bias cannot be excluded. Finally, while our conclusions cannot be extrapolated to the general population, they appear to be hypothesis generating and deserve future exploration in a larger multicenter study.

CONCLUSION

It is concluded that obesity is associated with less severe coronary artery disease.

REFERENCES

1. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL. Increasing prevalence of overweight among U.S. adults: the National Health and Nutrition Examination Survey. JAMA. 1994;272:205-211
2. Nanan D: Health Status of the Pakistani population. Am J Public Health. 2001 October; 91(10): 1545.
3. Eckel RH: Obesity and heart disease: a statement for healthcare professionals from the Nutrition Committee, American Heart Association. Circulation 1997;96:3248–50
4. Oreopoulos A, Padwal R, Norris CM, Mullen JC, Pretorius V, Kalantar-Zadeh K. Effect of obesity on short- and long-term mortality postcoronary revascularization:a meta-analysis. Obesity 2008;16:442–50.
5. Fonarow GC, Srikanthan P, Costanzo MR, Cintron GB, Lopatin M: An obesity paradox in acute heart failure: analysis of body mass index and inhospital mortality for 108,927 patients in the Acute Decompensated Heart Failure National Registry. Am Heart J 2007;153(1):74–81
6. Gruberg L, Weissman NJ, Waksman R, Fuchs S, Deible R, Pinnow EE, et al. The impact of obesity on the short-term and long-term outcomes after percutaneous coronary intervention: the obesity paradox? J Am Coll Cardiol 2002;39:578–584
7. Gurm HS, Brennan DM, Booth J, Tcheng JE, Lincoff AM, Topal EJ.: Impact of body mass index on outcome after percutaneous coronary intervention (the obesity paradox). Am J Cardiol 2002; 90:42–45
8. Mehta RH, O'neill WW, Harjai KJ, Cox DA, Brodie BR, Boura J, et al. Primary Angioplasty in Myocardial Infarction (PAMI) and the Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC) Investigators. Predictors of one-year mortality among 30-day survivors after primary percutaneous coronary interventions. Am J Cardiol 2006; 97:817–22
9. Lavie CJ, Milani RV: Obesity and cardiovascular disease: the Hippocrates paradox? J Am Coll Cardiol 2003;42:677–9.
10. Rubinshtein R, Halon DA, Jaffe R, Shahla J, Lewis BS: Relation between obesity and severity of coronary artery disease in patients undergoing coronary angiography. Am J Cardiol 2006;97(9:):1277–80.
11. Report of the expert committee on the diagnosis and classification of diabetes mellitus. Diabetes Care 1997;20:1183-97
12. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension 2003; 42; 1206-52.
13. Gurm HS, Whitlow PL, Kip KE: The impact of body mass index on short and long term outcomes in patients undergoing coronary revascularization. Insight from the bypass angioplasty revascularization investigation (BARI). J Am Coll Cardiol 2002; 39: 834–40.
14. Habib RH, Zacharias A, Schwann TA, Riordan CJ, Durham SJ, Shah A. Effects of obesity and small body size on operative and long-term outcomes of coronary artery bypass surgery: A propensity-matched analysis. Thorac Surg 2005;79:1976–1986