

Original Article

Association between Overweight and Increased Risk of Acute Myocardial Infarction

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ABSTRACT

Objective: To assess relationship of obesity with occurrence of coronary artery disease (CAD) in Iranian patients.

Methods: The CAD risk associated with obesity (body mass index ≥ 25.0) was assessed in a case-control study of acute myocardial infarction (AMI), which compared 200 AMI patients aged 40–79 years with 200 community controls, matched by age, gender and other risk factors.

Results: The prevalence of current overweight was much more frequent in cases compared with controls. Even after controlling for other CAD risk factors, obesity was associated with a 2-fold increase in the risk of AMI.

Conclusion: Current overweight is a CAD risk and was associated with a 2-fold increase in the risk of AMI. (Rawal Med J 2007;33:25-28).

Key Words: Myocardial infarction, obesity; overweight, coronary artery disease.

INTRODUCTION

Coronary artery disease (CAD) is the single most important disease entity in Western countries¹ and obesity is a risk factor for the occurrence of coronary events.² Furthermore, obesity often coexists with other CAD risk factors, such as hypertension, dyslipidemia and diabetes.¹ The prevalence of 'obesity' by the WHO criterion (body mass index BMI ≥ 30.0) has rapidly increased with the westernization of the life style, which has brought on other CAD risk factors associated with insulin-resistance

syndrome, such as hypertension, dyslipidemia and diabetes.³ The WHO Expert Committee in 1995 proposed the term of 'overweight' (BMI \geq 25.0) and drew special attention to the health effect of overweight in the association with increased mortality.⁴ More than half of the adult population in Western countries is 'overweight' and 20–25% in East Asia come into that category.³ However, because 'obesity' based on a BMI of 30.0 or greater is low in some countries such as Japan, thus the Japanese Society for the Study of Obesity redefined it as a BMI of 25.0 or greater.⁵

Some investigators have shown that obesity is a CAD risk factor in Asia as well as in Western countries,^{6,7} however, only the cohort studies⁷ shows that obesity remains a CAD risk factor after adjusting for other CAD risk factors, the case-control studies do not.⁶ The Framingham Heart Study shows that obesity is a CAD risk factor at 14, 20 or 26 year follow-up periods, but not at 6 or 8 year follow-up.² Thus, we assessed the CAD risk in relation to overweight in a case-control study of AMI in Iranian patients.

PATIENTS AND METHODS

Eligible cases were patients aged 40–79 years who were admitted to our hospitals in Tabriz, Iran after suffering from an AMI during September 2004 to September 2006. The diagnosis of AMI was based on the electrocardiogram, ischemic cardiac pain lasting at least 30 min, and enzyme changes. A total of 200 patients and 200 controls participated in the study. Variables such as smoking, history of hypertension, diabetes mellitus, hypercholesterolemia, height, body weight, current medication prior to the AMI, and the serum concentration of total cholesterol measured during admission were recorded. For the controls, a non-fasting, venous blood sample was taken for determination of serum lipids. If serum total cholesterol had been measured within 6 month before interview, the recorded data were obtained from the subjects. Hypertension was defined as present when subjects were under drug treatment. Subjects under dietary or drug treatment for diabetes mellitus were classified as having the disease. Hypercholesterolemia was considered present if subjects were under drug treatment or if the serum cholesterol concentration was 220 mg/dl or greater. A BMI \geq 25.0 was defined as overweight.

The study was approved by our institution's ethics committee and written informed consent was obtained from all study participants. Conditional logistic regression analysis was used to make adjustments for potential confounding variables. Odds ratio (OR) and 95% confidence intervals were obtained from the corresponding logistic regression coefficients and their standard errors. A p-value of <0.05 was considered statistically significant.

RESULTS

Compared with controls, body weight and BMI were greater in cases, more cases smoked and more of them had low physical activity and more were diagnosed as having hypertension, diabetes mellitus or hypercholesterolemia (table 1).

Table 1. Demographic features of study population.

Variable	Cases n=200	Controls n=200	P Value
Age (years)	60.2 ± 8	58.9 ± 1.5	0.2
Elderly ≥65 years	51(25.5%)	54(27%)	0.32
Men	120 (60%)	123 (61.5%)	0.41
Weight (kg)	74.1 ± 10.3	69.1 ± 10.5	< 0.01
Height (cm)	172.4 ± 7.3	175.5 ± 8.6	0.64
Body mass index(kg/m ²)	27.9 ± 3.4	26.1 ± 2.6	< 0.01
Moderate physical activity†	31 (15.5%)	54(27%)	< 0.01
Smoking‡	120 (60%)	82(41%)	< 0.01
Hypertension	63(31.5%)	29 (14.5%)	< 0.01
Diabetes Mellitus	42(21%)	18 (9%)	< 0.01
Hypercholesterolemia	65(32.5%)	32 (16%)	< 0.01

Values are expressed as mean±SD or number (%).

† Moderate exercise for 30 min or more per week,

‡ smoked every day over a period of 1 year or longer.

Overweight increased the risk of AMI in both men and women and was associated with an increased OR in both sexes (table 2). It remained a significant risk factor even after controlling age, life style (ie, smoking, physical activity) and medical history (ie, hypertension, diabetes mellitus and hypercholesterolemia) in men, but failed to do so after controlling age and medical history in women.

DISCUSSION

There are few reports showing that obesity is a CAD risk factor in Asia^{3,7,8} as it is in Western countries,¹⁻³ however, there are some that show obesity is not a risk factor among the Asian population.⁹ In a cross-sectional study of Japanese subjects, BMI was predictive of coronary stenosis among male patients, but not female patients, who underwent angiography because of clinical signs of coronary heart disease.⁹ Both cross-sectional and case-control studies have a weakness for showing the association between obesity and CAD. Most high-risk subjects, such as those with obesity and multiple CAD risk factors, might have died or suffered from CAD before the study because obesity often coexists with other CAD risk factors associated with insulin-resistance syndrome, such as hypertension, dyslipidemia and diabetes.^{1,3} A positive correlation between the frequency of insulin resistance and the accumulation of CAD risk factors has been observed in previous studies.¹⁰ In addition, changes in body weight are significantly related to changes in other CAD risk factors, such as blood pressure, fasting blood glucose, serum cholesterol, serum triglyceride and serum uric acid.⁹⁻¹²

The Framingham Heart Study showed that obesity is a CAD risk factor at the 14, 20 or 26 year follow-up, but not at the 6 or 8 year follow up periods.² Thus, only long lasting obesity may increase the risk of AMI. Also the Framingham study demonstrated that weight reduction decreases other CAD risk factors, such as hypertension, dyslipidemia, diabetes and hyperuricemia.

Table 2. Odds Ratio (OR) and 95% Confidence Interval (CI) of AMI according to Obesity in Men and Women.

	All n= 200 OR (95% CI)	Men n= 120 OR (95% CI)	Women n=80 OR(95% CI)
Group 1	1.82 (1.41-2.3)	1.84 (1.34-2.21)	1.92 (1.29-2.43)
Group 2	1.66(1.24-2.02)	1.77 (1.33-2.19)	1.50 (1.2-2.1)
Group 3	1.54 (1.15-1.9)	1.64 (1.29-2.07)	1.21 (0.71-1.72)

Group 1, adjusted for age; Group 2, adjusted for age, smoking, and physical activity; Group 3, adjusted for all of the above variables and medical history of angina pectoris, hypertension, diabetes mellitus and hypercholesterolemia.

Recently, the Japanese Society for the Study of Obesity proposed a new criterion for ‘obesity disease’ in Japan.⁵ In their definition, ‘obesity disease’ is obesity with complications that require weight reduction for their improvement or elimination. They showed that the number of obesity-related complications, such as hyperglycemia, dyslipidemia and hypertension, increased in accordance with BMI and those with a BMI \sim 25.0 had more than one CAD risk factors.⁵ A case-control study from India showed no association between BMI and AMI among subjects aged 30–60 years.¹³ Another from United States reported that BMI was rather lower in cases than controls among subjects aged 65 years or older.¹⁴ In our study, obesity remained as a significant CAD risk factor even after controlling other CAD risk factors in men, but failed to do so after in women, which may be partly explained by the fact that the number of female study subjects was small. Another explanation is that metabolic disorders such as diabetes mellitus show a higher CAD risk in women than men.^{15,16} In conclusion, the present study showed that overweight (not necessarily obesity) is associated with an increased risk of AMI. Thus, general community should be made aware that overweight is a risk factor for CAD and balanced diet and physical activity should be advocated.

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