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ASSOCIATION OF WAIST-HIP RATIO WITH SEVERITY OF CORONARY ARTERY DISEASE IN PATIENTS UNDERGOING CORONARY ANGIOGRAM FOR ACUTE CORONARY SYNDROME

Muzaffar Ali,[1] Usman Mahmood Butt,[2] Umer Aftab[3]

[1-3]Allama Iqbal Medical College / Jinnah Hospital, Lahore-Pakistan

Address for Correspondence:

Muzaffar Ali
Allama Iqbal Medical College/Jinnah Hospital, Lahore-Pakistan

Email: mzra750@hotmail.com

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Contribution

MA conceived, designed and did statistical analysis & manuscript writing. UMB did data collection and manuscript writing. UA did review and final approval of manuscript

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ABSTRACT

Objectives: To determine the association of increased waist-hip ratio with severe coronary artery disease.

Methodology: This case control study was conducted at Department of Cardiology, Jinnah Hospital, Lahore from13th December 2014 to 12th June 2015.Male shaving coronary artery disease (stenosis of > 50% in a major epicardial coronary artery) were included in the study and waist-hip ratio was determined at the time of inclusion into study. Matched controls were taken from same population. Waist-hip ratio of more than 0.95 was taken as increased waist-hip ratio. Odds ratio was calculated to determine the association of increased waist hip ratio with severe coronary artery disease.

Results: A sample of 360 including 180 in each cases and control groups were included with mean age of 41.62 ± 2.749 ranging from 35 to 45 years of age. Odds ratio (OR) for increased Waist/Hip ratio > 0.95 among cases and controls was 1.93 ($p < 0.028$). Stratification of Waist/Hip ratio > 0.95 with current smokers, 147 (88.6%) among cases were currently smoking with Waist / Hip ratio > 0.95 and 134 (8.2%) among controls that were currently smoking had Waist / Hip ratio > 0.95. (OR=1.905, p=0.037).

Conclusion: The study concluded that coronary heart disease risk increases with increase waist/hip ratio and is further augmented by smoking.

Key Words: Coronary artery disease, Myocardial infarction, Waist/Hip ratio.

INTRODUCTION

Cardiovascular diseases are the leading killer globally causing about 30% of all the deaths world wide with about 45% of deaths occurring due to coronary artery disease.[1,2] The disease burden is even higher in the people of Indo-Asian origin and it is expected to raise more than double over the next 20 years.[3] This burden in South Asians extends beyond regional concerns, as mortality and morbidity remain higher in even immigrant South Asians living in western regions as compared to the native western populations.[4] Obesity is a well-known factor associated with coronary artery disease.[5] Various methods for determining obesity include anthropometric measures such as body mass index (BMI), waist circumference, waist-hip ratio, neck circumference and subcutaneous fat layer thickness with body mass index as the most widely used method of measuring obesity. However, body mass index is not a sensitive measure of obesity. Studies have shown that BMI is not associated with mortality in patients with coronary artery disease whereas waist-hip ratio are better indicator of visceral obesity and coronary artery disease as compared to body mass index.[6,7] Hussain A at al. showed that waist hip ratio are also independent predictors of severity of coronary artery disease.[8] While measurements of obesity based on ultrasonography are not better to anthropometric indices for the prediction of CAD.[9] Zen at al. showed that waist hip ratio are also independent predictors of severity of coronary artery disease. The results of this study showed that waist-hip ratio > 0.95 was present in 83.2% of the cases of severe coronary artery disease as compared to 71.9% of the controls with odds ratio of 3.7 (1.4-10.1).[10] In a study by Bakhoum, et al, mean waist-hip ratio was found 0.96±0.07 in moderate to severe CAD and 0.88±0.05 normal to mild CAD.[11]

Majority of the studies conducted regarding relationship of obesity with coronary artery disease are based on body mass index which is a poor predictor of visceral obesity as compared to waist-hip ratio.[7,8] Moreover, limited and inconsistent data is available internationally about association of waist-hip ratio with severe coronary artery disease while a single local study is available which gives limited information because of absence of a control group.[12] Therefore, this study will generate further evidence regarding this association based on local data where the prevalence of obesity and coronary artery disease is much higher as compared to the western countries.

METHODOLOGY

A case control study was conducted in Department of Cardiovascular Medicine and Interventional Cardiology, Allama Iqbal Medical College, Jinnah Hospital, Lahore from 13th December 2014 to 12th June 2015. Sample size was calculated with 80% power of study, 5% level of significance and taking percentage of increased waist-hip ratio in 83.2% of the cases of severe coronary artery disease as compared to 71.9% of the controls through a non-probability consecutive/ purposive sampling. For cases male patients, age 20-45 years with history of chest pain on exertion (i.e. climbing >10 stairs) for at least one month, was considered. Severe coronary artery disease was defined as stenosis of > 50% in a major epicardial coronary artery i.e. left anterior descendent, circumflex or right coronary artery or their branches with at least 2.5 mm of diameter, determined by diagnostic coronary angiography. It was done at the time of inclusion into study. Age and gender matched controls were taken with no history chest pain on exertion (i.e. climbing >10 stairs) for at least one months. Patients already diagnosed as having diabetes and hypertension, with previous coronary artery revascularization by percutaneous or surgical intervention and dilated or hypertrophic cardio-myopathy determined by echocardiography were excluded from the study. All cases and controls underwent waist hip ratio measurement A waist-hip ratio of more than 0.95 was taken as increased waist-hip ratio. Data was entered and analyzed using SPSS version 17.0. Quantitative variable i.e. age was summarized as mean and standard deviation. Odds ratio was calculated to determine the association of increased waist hip ratio with severe coronary artery disease. Odds ratio of > 2 was taken as significant. Data was stratified for age, BMI, smoking and family history of coronary heart disease to deal with effect modifiers. Post stratification chi-square test was applied. P⩽0.05 was considered as significant.

RESULTS

Sample size of 360 subjects: 180 cases and 180 controls were included with mean age of 41.62 ± 2.749 years ranging from 35 to 45 years of age. About 225 patients (62.5%) were 40 years or more in age. Odds ratio (OR) for increased Waist/Hip ratio > 0.95 among cases and controls was1.93(p <0.028). Stratification of Waist/Hip ratio > 0.95 among age group, ⩾ 40 years showed that 108 (90.6%) of cases and 86 (91.7%) of controls had Waist / Hip ratio > 0.95 (OR=.79, p=0.559). For positive family history, 128(87.0%) cases with family history of disease had Waist/Hip ratio > 0.95 and 124 (94.2%) controls with family history had Waist/Hip ratio > 0.95. (p=0.078). Stratification of Waist/Hip ratio > 0.95 with current smokers showed that 147 (88.6%) currently smoker cases had Waist / Hip ratio > 0.95 and 134 (80.2%) among controls that were currently smoking had Waist / Hip ratio > 0.95. (OR=1.905, p=0.037). For obesity, 160(100.0%) patients with Body mass index >24.9kg/m^2 had Waist/Hip ratio > 0.95 and 145(100.0%) patients in control with Body mass index >24.9kg/m^2 had Waist/Hip ratio > 0.95. (Table1).

Table 1: Waist/Hip Ratio among Groups Cross Tabulation

		Waist/Hip ratio > 0.95		Total	
		Yes	No		
Group	Case	160	20	180	OR= 1.93 p = 0.028
		88.9%	11.1%	100.0%	
	Control	145	35	180	
		80.6%	19.4%	100.0%	
40 Years	Case	108	19	127	OR= .79 p = 0.559
		90.6%	9.4%	100.0%	
	Control	86	12	98	
		81.7%	18.3%	100.0%	
Family History of coronary artery disease	Case	128	19	147	OR= 1.74 p= 0.078
		87.0%	13.0%	100.0%	
	Control	124	32	156	
		79.5%	20.5%	100.0%	
Current Smoker	Case	147	19	166	OR=1.905 p= 0.037
		88.5%	1.5%	100.0%	
	Control	134	33	167	
		80.2%	19.8%	100.0%	
Body mass index >24.9kg/m2	Case	160	0	160	Cannot be computed due to constant. (0)
		100.0%	0	100.0%	
	Control	145	0	145	
		100.0%	0	100.0%	

DISCUSSION

Cardiovascular disease (CVD) is common in the general population, affecting the majority of adults past the age of 60 years. Coronary heart disease (CHD) accounts for approximately one-third to one-half of the total cases of CVD. The lifetime risk of CHD was illustrated in the Framingham Heart Study of 7733 participants, ages 40 to 94, who were initially free of CHD.[13] The life time risk for individuals at age 40 was 49 percent in men and 32 percent in women. Many risk factors for cardiovascular disease are modifiable by specific preventive measures. In the worldwide INTERHEART study of patients from 52 countries, nine potentially modifiable factors accounted for over 90 percent of the population-attributable risk of a first MI: smoking, dyslipidemia, hypertension, diabetes, abdominal obesity, psychosocial factors, daily consumption of fruits and vegetables, regular alcohol consumption, and regular physical activity.[14] Most patients with CVD have at least one established or borderline risk factor other than age and gender.15Thus an information regarding the determinants of myocardial infarction is very important to reduce the disease burden.16 The accumulation of fatty tissue in the body is related to inflammatory process which has direct relation with CHD.[17]

Waist-hip ratio is considered a better indicator of visceral obesity and coronary artery disease as compared to body mass index.[18] In our study, there is an association found between Waist/Hip ratio > 0.95, as odds ratio came out 1.93 with p =0.028. When we cross tabulated our study group (case & control) with waist to hip ratio above 0.95,it showed that Waist/Hip ratio > 0.95 had not been equally distributed among cases and controls.In our study, 88.9% of cases with severe coronary artery disease and 80.6% of controls had Waist/Hip ratio > 0.95. Our results match that of Zen et al. Zen at al. showed that waist hip ratio are also independent predictors of severity of coronary artery disease. The results of this study showed that waist-hip ratio > 0.95 was present

in 83.2% of the cases of severe coronary artery disease as compared to 71.9% of the controls with odds ratio of 3.7 (1.4-10.1).[10]

Our results contradict that of Chagas et al. that concluded that no anthropometric measurement is an independent predictor of coronary artery disease.[19] The difference may be secondary to population sampled. For better conflict resolution, a cohort study is needed. When we stratified the cross tabulated data of groups &Waist/Hip ratio > 0.95 with current smokers, 147 patients that were currently smoking found in case group with Waist/Hip ratio > 0.95 and 134 patients in control that were currently smoking had Waist/Hip ratio > 0.95. Results were statistically significant (p=0.038). It implies that there was effect of smoking on development of severe coronary artery disease.

In our study stratification of Waist/Hip ratio > 0.95 with family history of coronary artery disease, 128(87.0%) patients with family history of disease found in case group with Waist/Hip ratio > 0.95 and 124 (79.5%) patients in control with family history had Waist/Hip ratio > 0.95. Results were statistically non-significant (p=0.078).In our study, 305 patients (84.7%) had waist to hips ratio above 0.95. About 303 patients (84.2%) in our sampled population had family history of disease. About 333 patients (92.5%) were currently smokers. 305 patients (84.7%) had body mass index was above 24.9 kg/m2.All the indices are alarming. Considering the higher burden of disease in Pakistan as compared to the western countries 3 it becomes highly important to control these determinants of coronary artery disease.

CONCLUSION

The study concluded that coronary heart disease risk increase with increase waist/hip ratio and is further augmented by smoking.

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