A Study of the Anthropometric and Demographical Profile of Patients Presenting with Coronary Artery Disease at Mayo Hospital, Lahore

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Coronary artery disease (CAD) is very common in the South Asian sub-continent, yet there is relatively little published research available from these countries. Although we have a very active Cardiology Department in Mayo Hospital, Lahore, there is a parallel need for documentation of the data generated and its analysis for research and publication. This study was carried out to gain an insight into the nature of the risk factors and presentation of CAD in patients coming to our setup.

Objectives: The objective was to study the relation of CAD with anthropometric (BMI, waist circumference, waist – to – height ratio) and demographical (age and gender) factors.

Methodology: This study was carried out in the Department of Cardiology, Mayo Hospital, Lahore, for a duration of 17 months. We collected the required information (such as name, gender, and family history, demographical data and anthropometric measurements) on a prescribed proforma, managed and then analyzed accordingly.

Results: In this study there were 302 (80.5%) males and 73 (19.5%) females. The number of males was significantly higher (p-value 0.000), but the frequency of different diagnoses was statistically the same in both males and females, i.e. p-value = 0.062. According to the WHO recommended criteria for the BMI of South Asian populations, there were 9(2.4%) people who were under weight, among these 7 (77.8%) were males and 2 (22.2%) were females patients. Out of 302 males, 7(2.3%) were under weight, 36 (11.9%) were of normal weight, 115 (38.1%) were overweight and the rest of 144 (47.7%) were obese. Among 73 females, 2 (2.7%) were under weight, 8 (11%) had normal weight, 15 (20.5%) were overweight and 48 (65.8%) were obese. The proportion of obesity was more in females in this study, p-value (0.000). The mean waist circumference of all patients was 95.57 ± 17.14 cm with a range of 53 – 190 cm. The waist circumference was statistically higher in males than females, p-value = 0.000. In 7 under weight males, 6 patients had WC < 90 cm while one had ≥ 90 cm. Among 36 male patients of normal weight, 19 had WC < 90 and 17 had ≥ 90 cm, while in 115 over weight males 28 patients had WC < 90 cm and 87 had ≥ 90 cm. In 144 obese males 13 patients had WC < 90 cm and 131 had ≥ 90 cm. In males the mean waist to height ratio (WHtR) was 0.5789 ± 0.091 with the range (0.31 – 1.23) and in females it was 0.64 ± 0.11 cm with range (0.36 – 1.28).

Conclusion: Obesity as a risk factor is significantly present in our patients of coronary heart disease, more so in females, in which it appears to be more central or abdominal in character as compared to males, although there is considerable central adiposity in males, too. There is an imperfect correlation between the various measures of obesity, i.e., BMI, WC and WHtR when applied to our patients. More than one parameter should be used to reduce the chances of missing cases.

Key words: Heart Disease, Obesity, Risk Factors of Heart Disease.

Introduction

Coronary artery disease is narrowing of the epicardial coronary arteries, predominantly due to coronary atherosclerosis. Well – established risk factors for the disease include hyperlipidaemia, hypertension, insulin resistance and diabetes mellitus and cigarette smoking. Other factors which correlate with higher levels of coronary risk include lack of exercise, obesity and mental stress and depression. So – called novel or emerging risk factors include high sensitivity C – reactive protein, other markers of inflammation, homocysteine, fibrinogen and fibrin D – dimer, markers of firinolytic function and Lipoprotein (a). Un-modifiable risk factors include increasing age, gender (male sex) and heredity (including race). Sex hormones and indirectly, excessive alcohol intake also play a role in the causation of this disease.[1-4]

Obesity, particularly abdominal, and as a part of the insulin resistance (metabolic syndrome) is strongly associated with coronary heart disease.[5] Body Mass Index (BMI), waist circumference (WC), waist-hip ratio, waist – height ratio (WHtR), and other indices are used as measures of this type of obesity.[6,7] Asians have more central obesity than Caucasians and the WHO has re-defined criteria for BMI and WC for this group.[8-10] It also appears that the impact of obesity begins at a different threshold in Asian populations than among Caucasians and there is variation among various Asian ethnic groups.[11] Among Asians, people whose ethnic origin is from the South Asian sub-continent are more prone than other Asians to this form of obesity as well as CHD.[12]

A survey carried out in Pakistan, covering the period between 1990-1994, showed that a quarter of the Pakistani population is obese or overweight by Indo – Asian specific

BMI cutoff values.[13] Analysis of retrospective data from the Cardiology Department of Mayo Hospital, Lahore, also showed a correlation between obesity and heart disease on the basis of BMI measurement.[14]

Our study was a prospective study carried out in patients who presented clinically with ischaemic heart disease and underwent coronary angiography at the Cardiology Department, Mayo Hospital, Lahore, from March 2009 to July 2010. The aim of the study was to define the demographic characteristics of and risk factors operating in this particular patient population and compare these with the findings of studies carried out internationally in other ethnic groups as well as South Asian populations. We measured height and weight to calculate BMI as well as waist circumference and in this paper we would like to present the results pertaining to these particular findings .It would be particularly interesting to compare the actual prevalence of obesity in our patients of coronary heart disease with the current WHO recommendations for BMI and waist circumference for South Asians, since this is an ideal risk factor which can be targeted for prevention.

Objectives

The objective of this study was to study the relation of CAD with anthropometric (BMI, waist circumference, waist – to – height ratio) and demographical (age and gender) factors.

Materials and Methods

Study Design: Prospective, cross – sectional study design was used in this study.

Duration: 17 months from March 2009 to July 2010.

Settings: This study was carried out at the Department of Cardiology, Mayo Hospital, Lahore.

Target Population: All patients who underwent coronary angiography in the department during this period were studied.

Data Collection Method: We collected the required information (such as name, gender, family history, demographic and anthropometric features) on a prescribed proforma, managed and then analyzed accordingly. The BMI was calculated as the weight in kilograms divided by the height in squared meters (kg/m²) and were categorized according to WHO criteria for south Asian populations. The waist circumference (WC) was measured by tape measure in cm and was also categorized according to the WHO criteria for south Asian populations.[8,9] The waist- to- height ratio was assessed according to currently accepted criteria.[15]

Results

In this study there were 302 (80.5%) males and 73 (19.5%) females. Among 302 males 130 (34.7%) had myocardial infarction (MI), 149 (39.7%) had angina and 22 (6.1%) had other presentations of coronary heart disease. Among 73 females, 21 (5.6%) had MI, 47 (12.5%) had angina and 5 (1.3%) had other presentations. In this study males were significantly higher (p-value 0.000) but the frequency of different diagnoses was statistically same in both males and females, i.e. p-value = 0.062.

The mean age of patients with MI was 47.86 ± 9.54 years, and the mean age of patients with angina was 51.12 ± 9.6 years and the mean age of patients with other presentations was 50.64 ± 12.58 years. The mean age of patients having MI was statistically younger as compared to other diagnoses, p-value = 0.009.

According to the WHO recommended criteria for the BMI of Asian populations, there were 9 (2.4%) people who were under weight; among these 7 (77.8%) were males and 2 (22.2%) were female patients.

Only 44 (11.7%) patients had normal weight, in which 36 (81.8%) were males and 8 (18.2%) were females. There were 130 (34.7%) patients who were overweight in which 115 (88.5%) were males and 15 (11.5%) were females. More over 192 (51.2%) patients were obese, in which 144 (75%) were males and 48 (25.0%) were females. The males were significantly obese in this study, p-value = 0.002. If we take cumulative percentage then we may say that 85.9% were over the normal weight.

Out of 302 males 7 (2.3%) were under weight, 36 (11.9%) were normal weight, 115 (38.1%) were overweight and rest of 144 (47.7%) were obese. Among 73 females 2 (2.7%) were under weight, 8 (11%) had normal weight, 15 (20.5%) were overweight and 48 (65.8%) were obese. The proportion of obesity was more in females in this study, p-value (0.000).

Among the underweight patients, 4 (44.4%) had MI, 3 (33.3) had angina and 2 (22.2%) had other presentations. In patients who had normal weight, 19 (43.2%) had MI, 23 (52.3%) had angina and 2 (4.5%) had other presentations. Among the overweight group, 60 (46.2%) patients had MI, 62 (47.7%) patients had angina and 8 (6.2%) patients had other presentations. In the obese group, 68 (35.4%) patients had MI, 108(56.3%) had angina and 16 (8.3%) had other findings. Statistically the findings were independent of BMI, p-value (0.260).

The mean waist circumference of all patients was 95.57 ± 17.14 cm with a range of 53 – 190 cm. In the female group, the mean WC was 99.41 ± 19.15 cm and in male patients, it was 94.70 ± 16.58 cm. Among 302 males, 236 (78.1%) had WC ≥ 90 cm, while 66 (21.9%) had less than 90 cm. In 73 females, 70 (95.9%) had WC ≥ 80 cm and the rest of 4.1% had less than 80 cm. The waist circumference was statistically higher in males than females, p-value = 0.000.

In 7 under weight males, 6 patients had WC < 90 cm while one had ≥ 90 cm. Among 36 male patients of normal weight, 19 had WC < 90 and 17 had ≥ 90 cm, while in the 115 over weight, 28 patients had WC < 90 cm and 87 had ≥ 90 cm. In 144 obese males, 13 patients had WC < 90 cm

and 131 had ≥ 90 cm.

Among 8 females with normal weight, there were 2 females with WC < 80 cm and 6 females ≥ 80 cm. All 15 over weight and 48 obese females had WC ≥ 80 cm. The diagnosis of the patients did not have any signify-cant association with WC, p-value = 0.354.

In males, the mean waist – to – height ratio (WHtR) was 0.5789 ± 0.091 with a range of (0.31 – 1.23) and in females it was 0.64 ± 0.11 with a range of (0.36 – 1.28). Among 302 men, 3 (1%) were abdominally slim to underweight, 11 (3.6%) were extremely slim, 44 (14.6%) were healthy, 74 (24.5%) were overweight, 118 (39.1%) were seriously overweight and 52 (17.2%) were highly obese. In 73 females 1 (1.4%) was extremely slim, 2 (2.7%) were healthy, 4 (5.5%) were overweight and the rest of the 66 (90.4%) were highly obese.

Discussion

The mean age of patients in this study was 49.78 ±

Table 1: *Frequency table of Diagnosis, BMI, WC, WHtR with respect to gender.*

		Gender		Total	P-value
		Male	Female		
Diagnosis	MI	130	21	151	0.062
	Angina	149	47	196	
	Other	23	5	28	
Total		302	73	375	
BMI	Under weight	7	2	9	0.029
	Normal weight	36	8	44	
	Over weight	115	15	130	
	Obese	144	48	192	
	Total	302	73	375	
WC	Less than the Cut point	66	3	69	0.000
	More or equal	236	70	306	
	Total	302	73	375	
WHtR	Abdominally slim to underweight	3	0	3	0.000
	Extremely slim	11	1	12	
	Healthy	44	2	46	
	Over weight	74	4	78	
	Seriously over weight	118	0	118	
	Highly obese	52	66	118	
	Total	302	73	375	

Table 2: *Descriptive Statistics of Age (years), WC (cm) and WHtR (cm) with respect to gender.*

		Mean	Std. Deviation	Std. Error	Minimum	Maximum	p-value
Age (Years)	Male	49.701	10.1064	0.5816	19.0	74.0	0.745
	Female	50.107	8.9778	1.0508	30.0	72.0	
	Total	49.780	9.8867	0.5105	19.0	74.0	
WC (cm)	Male	94.9491	14.09060	0.81082	53.0	190	0.000
	Female	98.1541	15.74267	1.84254	56.0	177	
	Total	95.5730	14.46088	0.74676	53.0	190	
WHtR (cm)	Male	.5789	.09195	0.00529	.31	1.23	0.000
	Female	.6466	.11486	0.01344	.36	1.28	
	Total	.5920	.10032	.00518	.31	1.28	

9.89 years with a range of 19 – 74 years. This corresponds with other published data in south Asia.[16] In this study there were 80.5% males and 19.5% females. The vast majority of our patients had angiographically proven coronary artery disease. Obesity has long been regarded as a major modifiable risk factor for coronary heart disease[17] and appears to be independent of other lifestyle behaviors like diet, exercise, cigarette smoking.[18] There is evidence that obese subjects tend to develop myocardial infarction in a younger age group.[19] We wished to observe the overweight and obesity profile of our patients with proven coronary heart disease. We also wished to determine which of the commonly emploYyed measures of obesity, i.e., body mass index (BMI) ,waist circumference (WC) and waist-height ratio (WHtR) is most closely correlated with CAD.

Body mass index (BMI) has long been used as a measure of overweight and obesity and is correlated with increased prevalence of other risk factors as well as the presence of coronary heart disease.[20,21] It has been recognized that the South Asian population taken as a single ethnic group needs to be characterized differently from other ethnic groups, mainly Caucasians, in whom studies have been carried out.[22,23] We applied the WHO recommended criteria for BMI as applied to South Asian populations to our patients and found a very high proportion of overweight and obesity in both males and females in comparison with the prevalence in the population. Whereas only a quarter of the population was found overweight or obese by analysis of data from the National Health Survey of Pakistan (1990–1994),[13] 86% of males and females included in our study were overweight or obese. Further analysis of these figures showed that whereas 38.1% of males were overweight and 47.7% obese, the corresponding figure in women was 20.5% overweight and 65.8% obese. Women were much more obese as compared to men.

Abdominal, central or visceral obesity is now considered to be more closely related with coronary artery disease than total body obesity, as measured by BMI.[24] Waist circumference (WC) has been thought to be a more accurate measure of this form of obesity as compared to BMI by a number of investigators.[25] Using the WHO cutoff point of 90 cm for men and 80cm for women of South Asian origin, we found that 78% of men and 95.9% of women exceeded the cutoff point. Slightly more than half of normal weight (by BMI criteria) males had a waist circumference below the cutoff point and the rest exceeded it. Only one out of 7 under – weight males had a waist circumference above the cutoff point. Even in the obese and overweight category a small proportion of males were below the cutoff point of 90cm WC. In contradistinction to this, all obese and overweight, as well as the majority of normal weight females had a waist circumference exceeding 80cm.There appears to be a much higher incidence of central or abdominal obesity in females as compared to males. There also appears to be a very strong correlation with coronary heart disease.[26,27] It would be interesting to know the prevalence of increased waist circumference in normal females in our population. It has to be admitted that the sample size in case of females was considerably smaller.

Waist – height ratio (WHtR) is another parameter which has been advocated recently by a number of investigators.[28-30] Moreover 80.8% males were above normal weight by this yardstick, using a cutoff point of0.53 and 95.9% of females using a cutoff point of 0.49. Once again women fell into the more risky category with 90.4% above 0.58 (regarded as highly obese). Only 17.2% of men were in this category with a WHtR of 0.63.

Conclusion

The conclusion we can derive from the above findings is that obesity as a risk factor is significantly present in our patients of coronary heart disease, probably more so in females. Obesity in females appears to be more central or abdominal in character as compared to males, although there is considerable central adiposity in males, too. There is an imperfect correlation between the various measures of obesity, i.e., BMI, WC and WHtR when applied to our patients. More patients fell into the above normal weight category when using WHtR as compared to BMI indicating more central obesity in our population of patients. WC did not correlate well with BMI and there was considerable overlap. Perhaps more than one parameter should be used to reduce the chances of missing cases.

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