ORIGINAL ARTICLE

ABDOMINAL OBESITY PATTERN AMONG VARIOUS ETHNIC GROUPS PRESENTING WITH ACUTE CORONARY SYNDROME

Mazhar Mahmood, Tariq Ashraf, Mohammad Anis Memon, Abdul Samad Achakzai

National Institute Cardio Vascular Disease (NICVD), Karachi, Pakistan

Background: Abdominal obesity is an increasing public health problem and is associated with a number of cardiovascular risk factors. The aim of this study was to determine the frequency of abdominal obesity and associated risk factors in patients of various ethnic groups presenting with acute coronary syndrome. **Methods:** A total of 477 patients presenting with acute coronary syndrome to the National Institute of Cardiovascular Diseases, Karachi were studied. The sample was divided into 5 major ethnic groups, Muhajir, Punjabi, Sindhi, Pathan, Baluchi and Others. Waist circumference of each patient was taken at the level of iliac crest and abdominal obesity was defined according to the International Diabetes Federation criteria of 2005 for South Asians as waist circumference ≥ 90 Cm in males and ≥80 Cm in females. Patients were also assessed for diabetes mellitus, hypertension, smoking, low HDL and elevated triglycerides. **Results:** Out of 477 patients (355 males, 122 females), abdominal obesity was present in 318 (67%) patients, 62% of males and 81% of females were obese. Abdominal obesity was 62% in Muhajir, 78% in Punjabi, 67% in Sindhi, 68% in Pathan, 59% in Baluchi and 64% in others. Hypertension was present in 46%, Diabetes mellitus in 32%, Smoking in 33%, Low level of High density lipoprotein in 85.5% and raised triglycerides in 35% of patients. **Conclusion:** Abdominal obesity in Punjabi ethnic group is more common as compared to other ethnic groups. Low level of high density lipoprotein is almost universally present in patients with acute coronary syndrome.

Keywords: Abdominal obesity, Acute coronary syndrome, Waist circumference, Cardiovascular risk factors

INTRODUCTION

Obesity is a major public health problem and is increasing in prevalence in most parts of the world.[1] The morbidity and mortality associated with being overweight or obese have been known to the medical profession for more than 2000 years.[2] Overweight and obese individuals have a higher relative risk of hypertension, hypercholesterolemia, diabetes mellitus and metabolic syndrome as compared with normal weight individuals.[3,4] Conversely, weight loss is associated with a reduction in obesity-associated morbidity.[5] Now it has been recognised that increasing central adiposity by itself is associated with an increased risk of morbidity and mortality.[6]

According to World Health Organization (WHO) report, obesity has become epidemic in the world[1] and its prevalence is increasing in both developed[7] and developing countries.[8] According to the recent INTERHEART Study abdominal obesity is associated with increase risk of Myocardial infarction.[9] In Pakistan the prevalence of obesity derived from the National Health Survey of Pakistan (1990–94) was 10.3% measured by body mass index (25% if lower cut off valves for south Asians are used)[10], while in other local studies obesity was 28.6%[11] and 41%[12]. In comparison to body mass index, the prevalence of obesity measured by waist circumference was 57% in a study, indicating the high prevalence of abdominal obesity in our population.[13] However there are no local studies of obesity in patients with acute coronary syndrome, furthermore, the comparison of its burden in various local ethnic groups has also not been studied.

The method used most commonly in determination of overweight and obesity is body mass index (BMI). However BMI does not provide enough information regarding the distribution of fat especially central adiposity. Therefore, waist circumference (WC) has been declared the best and the simplest anthropometric measurement for abdominal obesity[14] and it is established that waist circumference predicts increased risk of morbidity and mortality[15] beyond that explained by BMI alone.

The aim of this study was to determine the frequency of abdominal obesity and associated cardiovascular risk factors in patients of various ethnic groups presenting with acute coronary syndrome.

MATERIAL AND METHODS

The study was carried out at the National Institute of Cardiovascular Diseases, Karachi from October 2009 to April 2010. A total of 477 Patients of age ≥18 who presented to the ER with acute coronary syndrome, were included in the study. Acute coronary syndrome was diagnosed with the help of typical chest pain, ECG changes and/or raised cardiac biomarkers (Troponin T, Troponin I or CK-MB). Formal approval of the protocol was obtained from the ethical committee of the National Institute of Cardiovascular Diseases, Karachi. Written informed consent was taken from the patients.

Patients who were aged <18 years, pregnant women, missing waist circumference and those who had renal impairment, stroke or chronic obstructive airway disease were excluded from the study. The sample was divided into five major ethnical groups, Muhajir, Punjabi, Sindhi, Pathan, Baluchi and Others.

To measure waist circumference, the upper hip bone and the top of the right iliac crest was located. The waist circumference was measured with a flexible tape placed on a horizontal plane around the abdomen at the level of the iliac crest. Before taking the measurements, it was ensured that the tape is snug, but does not compress the skin. The measurement was made to the nearest centimetre at the end of a normal expiration.[16]

Abdominal obesity was defined according to the International Diabetes Federation (IDF) criteria of 2005 for South Asians. In females a waist circumference ≥80 cm and in males a value ≥90 cm are considered abnormal. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters.

Hypertension was assessed using information by self-reported history and/or use of antihypertensive medication.[17] Diabetes mellitus was defined as fasting plasma glucose ≥126 mg/dl or those with history of diabetes and use of anti diabetic medications. High density lipoprotein level <40 mg/dl for males, high density lipoprotein level <50 mg/dl for females and triglycerides of >150 mg/dl were considered abnormal.

Continuous variables like age, waist circumference, height, weight, body mass index and laboratory findings were calculated as mean standard deviation. Categorical variables like gender, history of hypertension, diabetes mellitus, smoking and abdominal obesity were presented in frequencies and percentages. Chi-square test was used to see significant relationship of study variables between males and females and ethnic groups. All data were entered and analyzed through SPSS-15. A p-valve of 0.05 was considered statistically significant.

RESULTS

The study included a total of 477 patients with mean age of 53 years; 355 (74%) were males and 122 (26%) were females. The general characteristics of the study variables are described in Table-1. Abdominal obesity was present in 318 (67%) patients, with both sexes showing high value of abdominal obesity, 219 (62%) patients in the male group and 99 (81%) in the females group ($p<0.001$) had abdominal obesity (Figure-1).

Abdominal obesity as assessed in different ethnic groups also showed a high trend among all ethnical groups with 116 (62%) of Muhajir, 77 (78%) Punjabi, 34 (67%) Sindhi, 34 (68%) Pathan, 10 (59%) Baluchi, and 47 (64%) of others had

abdominal obesity (Figure-2). The relatively high value of abdominal obesity in Punjabi ethnic group as compared to other ethnic groups was evaluated for significance. The difference was statistically significant as compared to Muhajir ($p=0.007$) but was not significant as compared to other ethnic groups Punjabi/Sindhi ($p=0.146$), Punjabi/Pathan ($p=0.203$), Punjabi/Baluchi ($p=0.099$). Further analysis of ethnical groups revealed that within each ethnical group, female gender had high frequency of abdominal obesity as compared to males except in Sindhis, which had the same frequency of abdominal obesity (67%) in both males and females (Figure-3).

Forty-six percent of patients had hypertension and 32% had diabetes mellitus, both conditions were more common in females. Thirty-three percent of patients smoked and as expected almost all of them were males (Table-1). Low level of high density lipoprotein (HDL) was present in 408 (85.5%) patients and elevated triglycerides in 165 (35%) patients. The frequency of smoking, hypertension, diabetes mellitus, low HDL and raised triglycerides in the studied ethnical groups is tabulated in Table-2.

Table-1: General characteristics of Study Variables

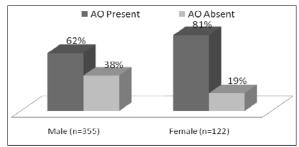| Variables	Total (n=477)	Males (n=355)	Females (n=122)
Age (years)	53.2±11.8	52.9±11.6	53.8±12.4
Height (m)	1.69±1.15	1.72±1.13	1.63±0.95
Weight (Kg)	71±15.2	72.5±15.3	66.8±14.2
BMI (Kg/m^2)	24.7±5.9	24.6±6.3	25±4.4
Waist Circumference (Cm)	94±15.6	94±15.5	94.1±15.9
SBP (mmHg)	133.4±25.5	131.1±24.4	139.9±27.5
DBP (mmHg)	83.5±13.9	83±14.1	84.8±13.3
Triglyceride (mg/dl)	141.4±85.5	138.5±75.8	149.7±108.8
HDL (mg/dl)	34.2±6.9	33.9±6.8	34.9±7.1
RBS (mg/dl)	161.8±88.2	156.7±84.1	176.6±98.1
Ethnicity			
Mohajir	187 (39.2%)	135 (38%)	52 (42.6%)
Punjabi	99 (20.8%)	66 (18.6%)	33 (27%)
Sindhi	51 (10.7%)	45 (12.7%)	6 (5%)
Pathan	50 (10.5%)	36 (10.1%)	14 (11.5%)
Balochi	17 (3.6%)	16 (4.5%)	1 (0.8%)
Others	73 (15.2%)	57 (16.1%)	16 (13.1%)
Hypertension	218 (45.7%)	143 (40.3%)	75 (61.5%)
Diabetes Mellitus	152 (31.9%)	103 (29%)	49 (40.2%)
Smoking	159 (33.3%)	150 (42.3%)	9 (7.4%)

Figure-1: Frequency of Abdominal obesity in Males & Females
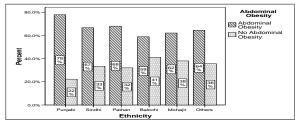AO=Abdominal Obesity

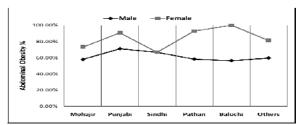**Figure-2: Frequency of Abdominal Obesity in Ethnic Groups**

Figure-3: Abdominal obesity of Males & Females in ethnic groups

Table-2: Cardiovascular risk factors in different ethnic groups

Ethnicity	Smokers	Hypertension	Diabetes Mellitus	Low HDL (HDL<40/50; M/F)	Elevated TGs
Mohajir (n=187)	53 (28.3%)	90 (48.1%)	69 (37%)	160 (85.6%)	63 (33.7%)
Punjabi (n=99)	39 (39.4%)	53 (53.5%)	36 (36.4%)	90 (90.9%)	39 (39.4%)
Sindhi (n=51)	23 (45.1%)	16 (31.4%)	8 (15.7%)	40 (78.4%)	14 (27.5%)
Pathan (n=50)	8 (16%)	23 (46%)	15 (30%)	45 (90%)	22 (44%)
Balochi (n=17)	8 (47.1%)	5 (29.4%)	5 (29.4%)	12 (70.6%)	4 (23.5%)
Others (n=73)	28 (38.4%)	31 (42.5%)	19 (26%)	61 (83.6%)	23 (31.5%)
Total (n=477)	159 (33.3%)	218 (45.7%)	152 (31.9%)	408 (85.5%)	165 (34.6%)

DISCUSSION

Obesity is a common problem world wide.[18] In addition to body mass index (BMI), waist circumference (WC) has been advocated as one of the most useful tool to define obesity. Waist circumference predicts increased risk of morbidity[9] and mortality.[15] Several organisations, including the National Institute of Health[19], currently advocate for the measurement of WC in clinical practice.

In the United States, the prevalence of abdominal obesity as determined by high waist circumference was found to be 46% in NHANES 1999 to 2000.[20] In Canada, fewer than 10 percent of people were obese in all nine provinces in 1985, in 2000, more than 20 percent of the people in five provinces were obese, a steady and distressing increase.[21] In UK, 23% of man and women were having obesity which has doubled from 1980 to 1993 and the trend has been uniform in both males and females.[22] In India the prevalence of obesity has been reported to be 21.5 %.[23] The prevalence of abdominal obesity in adults was found to be 30.4% in Turkey.[24] These data and those from other countries are indicative of a major international epidemic.

There is ethnic variability in waist circumference values that predict increased risk. It is well known that South Asian population have more total fat and visceral fat and are therefore may be at higher risk of developing type 2 diabetes for a given BMI than whites.[25,26]

Our study showed that in patients with acute coronary syndrome the frequency of abdominal obesity was quite high (67%) as compared to the general population. The prevalence of obesity in the general population of Pakistan was 10.3–25% by the National Health Survey of Pakistan (1990−1994).[10] In other local studies the prevalence of obesity was and 57% (by waist circumference) as studied by Mohammad Noor *et al*.[13] The INTERHEART Study[9] which included patients with acute myocardial infarction from 52 countries showed abdominal obesity to be present in 52.6% of cases. The INTERHEART Study also showed that abdominal obesity is associated with increased risk of acute myocardial infarction, which may explain the high trend of abdominal obesity in patients with acute coronary syndrome in our study. The female preponderance in our study was also evident in other local and international studies.[9,12,13,27]

Abdominal obesity was a major problem among patients of all ethnic groups which probably is due to the common habit of intake of high caloric, oily food, rich in saturated fat (*ghee*) and carbohydrates, less consumption of fruits, vegetables and high fibre diets and a sedentary life style.[11] Females mostly remain at home in our society and have more sedentary life in our society as compared to men, which explains the high frequency of abdominal obesity in females as compared to men. The Punjabi ethnic group, however, showed relatively high frequency of abdominal obesity as compared to other ethnic groups. This difference was statistically significant as compared to Muhajirs but was statistically non-significant as compared to other ethnic groups. These findings indicate that abdominal obesity in patients with acute coronary syndrome is a major health problem in our country and is highly prevalent in all ethnic groups. The observation of high frequency of abdominal obesity in Punjabis as compared to others, however, needs validation in other local studies.

Cardiovascular risk factors like smoking, hypertension, diabetes mellitus, low HDL and elevated triglycerides, were present with increased frequency in our study (Table-2). The value of low HDL in acute coronary syndrome patients is strikingly high (85.8%) and it has been observed in various studies that low HDL is associated with coronary artery disease.[28] In comparison to our study, the magnitude of low HDL in asymptomatic subjects, as studied by Abdul Jabbar *et al*[29] is also high (50%) which indicate the high prevalence of low HDL in our population. This factor,

in addition to other cardiovascular risk factors, may be responsible for the high incidence of coronary artery disease in our country.

LIMITATIONS OF THE STUDY

As this is a single centre study, ethnical groups may not have been adequately represented. Comparison of the sample with normal ethnic population was not done which can be helpful for planning of primary prevention. The Baluchi group sample was considerably small which limited its comparison with other ethnical groups. Hypertension was defined by self reported history of hypertension or use of antihypertensive medications which might have underestimated the true magnitude of hypertension.

CONCLUSION

Abdominal obesity is a major health problem in patients of various ethnic groups with acute coronary syndrome. Abdominal obesity in Punjabi ethnic group is more common as compared to other ethnic groups. Low level of high density lipoprotein is almost universally present in patients with acute coronary syndrome. The importance of weight reduction measures should be emphasised to have favourable influence on the cardiovascular health of our society.

REFERENCES

1. WHO. Obesity: Preventing and managing the global epidemic. Geneva, Switzerland: Report of a WHO Consultation on World Health Organization 1997.
2. Alpert MA, Hashimi MW. Obesity and the heart. Am J Med Sci 1993;306:117–23.
3. Humayun A, Shah AS, Sultana R. Relation of hypertension with body mass index and age in male and female population of Peshawar, Pakistan. J Ayub Med Coll Abbottabad 2009;21(3):63–5.
4. Nguyen, NT, Magno, CP, Lane, KT, Hinojosa MW, Lane JS. Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: Findings from the National Health and Nutrition Examination Survey, 1999 to 2004. J Am Coll Surg 2008;207:928–34.
5. Klein S, Burke LE, Bray GA, Blair S, Allison DB, Pi-Sunyer X, *et al*. American Heart Association Council on Nutrition, Physical Activity, and Metabolism. Clinical implications of obesity with specific focus on cardiovascular disease: a statement for professionals from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation. Circulation 2004;110:2952–67.
6. Simpson JA, MacInnis RJ, Peeters A, Hopper JL, Giles GG, English DR. A comparison of adiposity measures as predictors of all-cause mortality: the Melbourne Collaborative Cohort Study. Obesity (Silver Spring) 2007;15:994–1003.
7. Prentice AM, Jebb SA. Obesity in Britain: gluttony or sloth? Br Med J 1995;311:437–9.
8. Popkin BM, Paeratakul S, Ge K, Zhai F. Weight pattern among the Chinese: Results from 1989 and 1991 China Health and Nutrition Surveys. Am J Public Health 1995;85:690–4.
9. Mente A, Yusuf S, Islam S, McQueen MJ, Tanomsup S, Onen CL, *et al*, for the INTERHEART Investigators. Metabolic Syndrome and Risk of Acute Myocardial Infarction: A Case-Control Study of 26,903subjects From 52 Countries. J Am Coll Cardiol 2010;55;2390–8.
10. Jafar TH, Chaturvedi N, Pappas G. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. CMAJ 2006;175:1071–7.
11. Shafi S, Rao MH, Soomro IBM. The effect of life style and socio-economic factors in the development of obesity in young adults. Pak J Med Res 2004;43(2):65–9.
12. Dennis B, Aziz K, She L, Faruqui AM, Davis CE, Manolio TA, *et al*. High rates of Obesity and Cardiovascular disease risk factors in lower middle class community in Pakistan: the Metroville Health Study. J Pak Med Assoc 2006;56(6):267–72.
13. Noor M, Raza UA, Zeeshan MF, Mohammad W. Frequency of abdominal waist circumference and risk factors in healthy adults. J Postgrad Med Inst 2007;21(4):248–55.
14. Akpinar E, Bashan I, Bozdemir N, Saatci E. Which is the best anthropometric technique to identify obesity: body mass index, waist circumference or waist-hip ratio? Coll Antropol 2007;31:387–93.
15. Bigaard J, Tjonneland A, Thomsen BL, Overvad K, Heitmann BL, Sorensen TI. Waist circumference, BMI, smoking, and mortality in middle aged men and women. Obes Res 2003;11:895–903.
16. National Health and Nutrition Examination Survey Data [article online], 2006. Hyattsville, MD, National Center for Health Statistics. Available from http://www.cdc.gov/nchs/about/major/nhanes/datalink.htm. Accessed 6 April 2007.
17. Haapanen N, Miilunpalo S, Pasnen M, Oja P, Vuori I. Agreement between questionnaire data and medical records of cronic diseases in middle aged and elderly finnish men and women. Am J Epidemiol 1997;145:762–9.
18. Kumanyika SK. The obesity epidemic: looking into the mirror. Am J Epidemiol 2007;166:243–5.
19. National Institute of Health: clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. Obes Res 1998;6(Suppl. 2):51s–209s.
20. Earl S. Ford, Ali H, Wayne H. Trends in waist circumference among US adults. Obes Res 2003;11:1223–31.
21. Katzmarzyk, PT. The Canadian obesity epidemic, 1985–1998. CMAJ 2002;166:1039–40.
22. Seidell, JC Rissanen, AM. Prevalence of Obesity in Adult: The Global Epidemic. In: Bray, GA, Bouchard, C (Eds). The Handbook of Obesity. New York: Dekker; 2002.
23. Sood RK, Gupta AK, Ahlualia SK, Dhadwal D, Sharma RK, Sood K, *et al*. An epidemiological study of obesity in Shimla town. Ind J Med Sci 1996;50:362–4.
24. Oguz A, Temizhan A, Abaci A, Kozan O, Erol C, Ongen Z, *et al*. Obesity and abdominal obesity; an alarming challenge for cardio-metabolic risk in Turkish adults. Anadolu Kardiyol Derg 2008;8:401–6.
25. Deurenberg, P, Yap, M, van Staveren, WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. Int J Obes Relat Metab Disord 1998;22:1164–71.
26. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr 2000;72:694–701.
27. Yabanci N, Gocgeldi E, Simsek I, Kilic S. prevalence of obesity, abdominal obesity and the associated risk factors among a group of Turkish adults. Pak J Med Sci 2010;26(1):21–5.
28. Rosenson, RS. Low HDL-C: a secondary target of dyslipidemia therapy. Am J Med 2005;118:1067–77.
29. Abdul Jabbar Irfanullah A, Akhter J, Mirza Y. Dyslipidemia and its relation with body mass index versus waist hip ratio. J Pak Med Assoc 1997;47(12):308–10.

Address for Correspondence:

Dr. Mazhar Mahmood, Flat No. 5, Block No. 31, Defence Garden Apartments, DHA Phase 1, Karachi, Pakistan.
Email: maz1238@yahoo.com