

## ORIGINAL ARTICLE

**Association of Acute Coronary Syndrome with Waist Hip Ratio in Local Population of Islamabad Capital Territory, Pakistan**Hesham Naeem<sup>1</sup>, Farrah Qayyum<sup>2</sup>, Hina Qayyum<sup>3</sup>, Saba Murad<sup>4</sup>, Zara Khalid<sup>5</sup>

## ABSTRACT

**Objective:** To determine the frequency and association of waist-hip ratio with acute coronary syndrome in local population of Islamabad, Pakistan.

**Study Design:** Analytical cross-sectional.

**Place and Duration of Study:** The study was carried out in the department of Cardiology, Pakistan Institute of Medical Sciences, Islamabad for the duration of six months (December 2014-June 2015).

**Materials and Methods:** A total of 388 patients presented with acute coronary syndrome which included patients with unstable angina, non-ST elevation and ST elevation MI. Non-probability purposive sampling was used for sample selection. After taking informed consent, a self-structured questionnaire was used to collect the data. Waist-hip ratio was assessed using tape measure. Waist circumference was measured between the last rib and iliac crest, whereas the measurement of hip circumference was done at the level of greater trochanters. A waist-hip ratio of >0.85 for females and >0.9 for males was taken as abnormal. Data was analyzed on SPSS Version 17.0. Chi square test was applied to find out the association between waist-hip ratio and other variables whereas p-value of <0.05 was considered as significant.

**Results:** Out of total 388 acute coronary syndrome patients, 70.9% patients were males and 29.1% were females. The mean age of these patients was 47.5±18.46 years. Out of the total study population, 59.5% patients of ACS had abnormal waist hip ratio (>0.9). Among the patients having abnormal waist hip ratio, 62.9% were males and 51.3% were females. 71.6% patients presented with STEMI, 18.8% with NSTEMI and 9.5% with unstable angina. Chi square test depicted non-significant association of waist-hip ratio with ACS (p>0.05). A significant association was found between WHR and gender (p<0.05).

**Conclusion:** There is no significant association between waist-hip ratio and acute coronary syndrome. The frequency of acute coronary syndrome is highest among males, with maximum prevalence of STEMI, followed by NSTEMI and unstable angina.

**Key Words:** *Acute Coronary Syndrome, Coronary Artery Disease, Obesity, Waist-Hip Ratio.*

**Introduction**

One of the highest reasons of mortality in developing countries is attributed to cardiovascular diseases, which refer to a group of cardiac conditions which include coronary heart disease (CHD), coronary artery disease (CAD) and acute coronary syndrome

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(ACS). ACS is associated with myocardial infarction (MI) and is usually symptomatic such as the presence of unstable angina.<sup>1</sup> A report by the Heart Disease and Stroke Statistics update of the American Heart Association in 2016 showed that CHD is prevalent in 15.5 million individuals aged > 20 years, and there was a proportional increase in prevalence with age in both genders.<sup>2</sup> One third of all the fatalities in persons aged 35 years and above occurs due to CHD.<sup>3</sup> In Pakistan, acute coronary syndrome is more prevalent in males.<sup>4</sup>

Risk of heart diseases increases in the presence of risk factors. A most common modifiable risk factor is sedentary lifestyle or physical inactivity leading to obesity.<sup>5</sup> Globally, overweight and obesity are being considered as main public health issues due to their relation with various chronic diseases for instance type 2 diabetes, cardiovascular diseases and cancers.<sup>6</sup> There are multiple means of estimating the

body size or excess body weight, of which the most commonly used method, is the traditional measurement of body mass index (BMI). However in the last few years, alternative measures of central adiposity, namely waist-height ratio, waist circumference and waist-hip ratio (WHR) have been found to be better for prediction of CVD risks as compared to BMI, due to their accurate depiction of body fat distribution.<sup>7,8</sup> It is also due to the fact that multiple metabolic abnormalities are associated with increased visceral adiposity. These include a decrease in glucose tolerance, reduction in insulin sensitivity and deranged lipid profile, all of which are CVD and type 2 diabetes risk factors.<sup>9</sup>

There is found to be uncertainty and variation regarding the performance of these anthropometric measures across different ethnicities. Among the Asian population, central obesity is emerging as a problem, as these individuals have large waist circumference (WC), but a normal BMI. As per WHO guidelines, BMI 25-29.9 kg/m<sup>2</sup> which lies in overweight category, corresponds with a WC of 80.0-87.9 cm in women and 94.0-101.9 cm in men and a WHR of 0.9 and 0.85 in males and females respectively. Yet these values are derivative of Caucasians, and might not be applicable for the non-Caucasian population. It is still unclear that which of the afore-mentioned measures has a strong association with the risk of developing cardiovascular disease in various ethnicities.<sup>6</sup>

It is reported in literature that waist hip ratio is the most useful and favored method of measuring obesity for the purpose of identification or prediction of CVD risk factors.<sup>10,11</sup> Risk stratification is an essential part of initial diagnosis and management of acute coronary syndrome. Hence the value of assessment of waist-hip ratio as a quantifiable measure of obesity, during physical examination of at-risk patients still needs to be determined in our population. As per our knowledge, data regarding the relation of these measures with cardiac diseases in Pakistani population is still lacking. Therefore, this study was carried out to determine the frequency and association of waist-hip ratio with acute coronary syndrome (ACS) in local population of Islamabad.

### Materials and Methods

An analytical cross-sectional study was conducted on

388 patients with acute coronary syndrome reporting to Cardiology department of Pakistan Institute of Medical Sciences, Islamabad. This study spanned over duration of six months (December 2014-June 2015). Sample calculation was done using Rao soft sample size calculator, while keeping 95% confidence interval and 5% margin of error. Non-probability purposive sampling technique was employed. The inclusion criteria comprised of 30-70 years aged male and female patients, presenting with coronary artery disease or acute coronary syndrome consisting of non-ST elevation myocardial infarction, ST elevation MI and unstable angina. The patients with chronic kidney disease, compensated or decompensated liver disease or with gestation were not included the study. Ethical approval was obtained from the ethics review committee of Pakistan Institute of Medical Sciences, Islamabad. Informed consent from all participants was taken after explaining the study procedure. Demographic data was recorded using a self-structured questionnaire. Waist-hip ratio was assessed by measuring the waist and hip circumference with a tape measure. The subjects were instructed to stand straight with feet closed together, arms at sides and even distribution of body weight. The measurement of waist circumference was done mid-way between the last rib and iliac crest, whereas hip circumference was measured at the level of greater trochanters, with legs close together. A waist-hip ratio of >0.85 for females and >0.9 for males was taken as abnormal.<sup>12</sup> Statistical analysis of data was done on SPSS (Version 17, SPSS Inc, and USA). Frequencies and percentages were used to express the categorical variables. Chi square test was applied to find out the association between waist-hip ratio and other variables whereas p-value of  $\leq 0.05$  was considered as significant.

### Results

The sample comprised of 388 ACS patients including 275 (70.9%) males and 113 (29.1%) females. (Table I) The mean age of the sample was  $47.5 \pm 18.46$  years. In this study the patients were divided into three categories according to their diagnosis. The results showed 278 (71.6%) patients presenting with ST elevation myocardial infarction (STEMI), 73 (18.8%) with non-ST segment elevation myocardial infarction (NSTEMI) and 37 (9.5%) with unstable angina. Gender wise distribution of the 3 types of ACS

presentation has been shown in Table I. Chi square test of association showed non-significant association of waist-hip ratio and acute coronary syndrome ( $p>0.05$ ). (Table II)

Out of total 388 patients, 231 (59.5%) had abnormal waist hip ratio. Among the patients having abnormal waist hip ratio, there were 173 (62.9%) males and 58 (51.3%) females. Chi square test of association depicted significant association of gender with waist-hip ratio ( $p<0.05$ ). (Table III)

**Table I: Demographics and Presentation of ACS Subjects (N=388)**

Diagnosis	Males N (%age)	Females N (%age)
Total ACS patients	275 (70.9%)	113 (29.1%)
1. STEMI	195 (70.9%)	83(73.5%)
2. Non-STEMI	55(20%)	18(15.9%)
3. Unstable Angina	25(9.1%)	12(10.6%)

**Table II: Association of Waist-Hip Ratio with Different Types of ACS**

Variables		Waist-hip ratio		P-value
		Normal** (n)	Abnormal*** (n)	
Diagnosis	STEMI	115	163	0.422
	Non-STEMI	25	48	
	Unstable Angina	17	20	

\*\*Normal WHR ( $\leq 0.85$  for Female,  $\leq 0.9$  for Male)

\*\*\*Abnormal WHR ( $> 0.85$  for Female &  $>0.9$  for Male)

**Table III: Association of Waist-Hip Ratio with Gender (Males & Females)**

Variables		Waist-hip ratio		p-value
		Normal** (n)	Abnormal*** (n)	
Gender	Males	102	173	0.035*
	Females	55	58	

\* Shows Significant Value  $p < 0.05$

\*\*Normal WHR ( $\leq 0.85$  for Female,  $\leq 0.9$  for Male)

\*\*\*Abnormal WHR ( $> 0.85$  for Female &  $>0.9$  for Male)

**Discussion**

This study was conducted to find out the frequency and association of waist-hip ratio with acute coronary syndrome (ACS) in local population of Islamabad. The patients were divided into three distinct categories according to the type of acute coronary syndrome with which they presented to

hospital.

We observed a majority of sample presenting with ST elevation myocardial infarction (STEMI) which was the most frequent type of ACS among both genders, followed by non ST elevation myocardial infarction (NSTEMI), and then unstable angina. These results are similar to the results of a study conducted in 2013 on the role of central obesity in risk stratification after an acute coronary event, in which total 285 patients were admitted wherein 96.1% reported myocardial infarction (STEMI and NSTEMI) and 3.9% had unstable angina.<sup>13</sup> Regarding gender distribution, 71% of our sample comprised of male patients with ACS and only approximately 29% females. As per a review article on gender differences in coronary heart diseases, the development of cardiovascular diseases occurs 7-10 years later in women as compared to men. The risk of developing heart diseases is quite often underestimated in women and the resulting under-recognition along with different clinical presentation leads to a reduced representation of females in studies and clinical trials.<sup>14</sup>

There are various measures to assess abdominal adiposity as a means of predicting CVD risk factors, of which waist-hip ratio (WHR) is the most favored. In the current study, more than half almost 60% of the sample had abnormal waist-hip ratio, higher than the normative standard. A study on central obesity and mortality risk in older adults with coronary artery disease concluded that higher values of waist hip ratio are predictive of a greater risk of mortality.<sup>15</sup> In our study, we found a non-significant association between waist hip ratio and acute coronary syndrome. Our results support the findings of a study on relationship of physical fitness v/s BMI with CAD and cardiovascular events in women which also showed that after adjusting for other risk factors, BMI and other abdominal obesity measures (WHR, waist circumference) were not significantly associated with coronary artery disease or its adverse effects ( $p=0.05-0.88$ ). Rather physical fitness and functional capacity were more important and were significantly associated with cardiovascular outcomes such as ACS.<sup>16</sup> No significant association was found between abnormal waist-hip ratio and acute coronary syndrome possibly because acute coronary syndrome is multi-factorial and depends on

other risk factors as well. Contrary to this, a study on impact of body mass index and WHR on clinical outcomes in patients with STEMI showed that highest WHR was one of the mortality risk factors due to ACS. Yet this study also recommended further observing these associations in larger population cohort studies.<sup>17</sup>

The results of the current study also found that waist hip ratio was significantly associated with gender, wherein the proportion of males was higher in abnormal WHR category as compared to females. This is in contradiction to a study done on southern Chinese population which showed that abdominal obesity was more prevalent in females. Gender differences could be explained by the hormonal changes and varying physical activity levels in males and females.<sup>18</sup>

Overweight and obesity, be it central or abdominal, poses many challenges for treatment of coronary heart diseases. The cornerstone of primary prevention is the assessment of atherosclerotic cardiovascular disease risk which includes estimation of multiple risk factors. Management of obesity along with associated increase in physical activity and cardiorespiratory fitness levels is currently being recommended for a subsequent reduction in cardiovascular morbidity and mortality burden.<sup>19,20</sup>

The current study has been conducted in only one hospital of Islamabad limiting the generalization of the results to whole population. However, future studies on larger samples and in multiple settings are recommended to observe the association of ACS with other probable risk factors using objective measures.

## Conclusion

Based on the results of statistical data analysis we conclude that there is no significant association between waist-hip ratio and acute coronary syndrome. The frequency of acute coronary syndrome is highest among males, with maximum prevalence of STEMI, followed by NSTEMI and unstable angina. Furthermore, a significant association exists between WHR and gender.

## REFERENCES

- Lippi G, Sanchis-Gomar F, Cervellin G. Chest pain, dyspnea and other symptoms in patients with type 1 and 2 myocardial infarction. A literature review. *International journal of cardiology*. 2016;215:20-2.
- Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Executive summary: heart disease and stroke statistics-2016 update: a report from the American Heart Association. *Circulation*. 2016;133(4):447-54.
- Rosamond W, Flegal K, Furie K, Go A, Greenlund K, Haase N, et al. Heart disease and stroke statistics—2008 update. *Circulation*. 2008;117(4):e25-e146.
- Jafary MH, Samad A, Ishaq M, Jawaid SA, Ahmad M, Vohra EA. Profile of acute myocardial infarction (AMI) in Pakistan. *Pakistan Journal of Medical Sciences*. 2007;23(4):485.
- Leischik R, Dworak B, Strauss M, Przybylek B, Schöne D, Horlitz M, et al. Plasticity of health. *German Journal of Medicine*. 2016;1:1-17.
- Huxley R, Mendis S, Zheleznyakov E, Reddy S, Chan J. Body mass index, waist circumference and waist: hip ratio as predictors of cardiovascular risk—a review of the literature. *European journal of clinical nutrition*. 2010;64(1):16.
- Welborn T, Dhaliwal S. Preferred clinical measures of central obesity for predicting mortality. *European journal of clinical nutrition*. 2007;61(12):1373.
- Ashwell M, Hsieh SD. Six reasons why the waist-to-height ratio is a rapid and effective global indicator for health risks of obesity and how its use could simplify the international public health message on obesity. *International journal of food sciences and nutrition*. 2005;56(5):303-7.
- Organization WH. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. 2011.
- Welborn TA, Dhaliwal SS, Bennett SA. Waist-hip ratio is the dominant risk factor predicting cardiovascular death in Australia. *Medical journal of Australia*. 2003;179(11/12):580-5.
- Dalton M, Cameron A, Zimmet P, Shaw J, Jolley D, Dunstan D, et al. Waist circumference, waist-hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults. *Journal of internal medicine*. 2003;254(6):555-63.
- Organization WH. Obesity: preventing and managing the global epidemic: report of a WHO consultation on obesity, Geneva, 3-5 June 1997. Geneva: World Health Organization; 1998.
- Martins A, Ribeiro S, Gonçalves P, Correia A. Role of central obesity in risk stratification after an acute coronary event: Does central obesity add prognostic value to the Global Registry of Acute Coronary Events (GRACE) risk score in patients with acute coronary syndrome? *Revista Portuguesa de Cardiologia (English Edition)*. 2013;32(10):769-76.
- Maas AHM, Appelman YEA. Gender differences in coronary heart disease. *Netherlands Heart Journal*. 2010;18(12):598-603.
- Sharma S, Batsis JA, Coutinho T, Somers VK, Hodge DO, Carter RE, et al., editors. Normal-weight central obesity and mortality risk in older adults with coronary artery disease. *Mayo Clinic Proceedings*; 2016: Elsevier.
- Wessel TR, Arant CB, Olson MB, Johnson BD, Reis SE, Sharaf BL, et al. Relationship of physical fitness vs body mass index

- with coronary artery disease and cardiovascular events in women. *Jama*. 2004;292(10):1179-87.
17. Lee S-H, Park J-S, Kim W, Shin D-G, Kim Y-J, Kim D-S, et al. Impact of body mass index and waist-to-hip ratio on clinical outcomes in patients with ST-segment elevation acute myocardial infarction (from the Korean Acute Myocardial Infarction Registry). *The American journal of cardiology*. 2008;102(8):957-65.
  18. Hu L, Huang X, You C, Li J, Hong K, Li P, et al. Prevalence of overweight, obesity, abdominal obesity and obesity-related risk factors in southern China. *PLoS one*. 2017;12(9):e0183934.
  19. Lavie C, Arena R, Alpert M, Milani R, Ventura H. Management of cardiovascular diseases in patients with obesity. *Nature reviews Cardiology*. 2018;15(1):45.
  20. Arnett DK, Blumenthal RS, Albert MA, Michos ED, Buroker AB, Miedema MD, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease. *Journal of the American College of Cardiology*. 2019:26029.
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