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Evaluate of Angiographic Severity of Coronary Artery Disease in Patients with NSTEMI by Gensini Score and Vessel Score

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Abstract **Original Research Article**

Background*:** Cardiovascular disease is leading cause of mortality and morbidity in developed and developing countries. Metabolic syndrome (MS) is a risk factor for coronary artery disease (CAD). ***Objective: The aim of this study is to evaluate the angiographic severity of coronary artery disease in patients with NSTEMI by Gensini score and \Vessel score. ***Methods:*** This cross-sectional observational study was done at the National Institute of Cardiovascular Diseases (NICVD), Dhaka. A total of 100 patients with NSTEMI underwent coronary angiography were included in the study. Coronary angiogram was done during index hospital admission. On the basis of WHR, study patients were divided into two groups: 50 patients of NSTEMI with normal WHR (Male <0.90, Female <0.80) were assigned as group I and 50 patients of NSTEMI with increased WHR (Male ≥0.90, Female ≥0.80) were assigned as group II. ***Results*:** In this study patients with non-critical CAD (14% vs 0%, *P* = 0.02) and single vessel disease (58% vs 24%, *P* = 0.005) were more frequent in Group I, on contrary double vessel disease (24% vs 56%, *P* = 0.001) and triple vessel disease (4% vs 20%, *P* = 0.03) were more frequent in patients of Group II with significant difference. ***Conclusion*:** WHR levels were found to be higher in patients with high degree of angiographic stenosis in terms of Genseni's score.

Keywords: Waist-hip ratio, Angiographic severity, Coronary artery disease, NSTEMI.

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INTRODUCTION

Coronary artery disease (CAD) is a common and leading cause of death throughout the world. In Bangladesh it is also an increasingly important medical and public health problem, and is the leading cause of mortality. Like other South Asians, Bangladeshis are unduly prone to develop CAD, which is often premature in onset, angiographically more severe and follows a rapidly progressive course [1].

Among the CAD, Acute Myocardial Infarction (AMI) is one of the most common life threatening diagnosis. In addition epidemiological data suggest that acute coronary syndrome (ACS) cases with Non-ST elevated Myocardial Infarction (NSTEMI) occurs more frequently than ST elevated Myocardial Infarction (STEMI) [2]. In the USA, it is estimated that >780,000 people will experience an ACS each year, and approximately 70% of these people will have NSTEMI (British Medical Journal Best Practice, 2017) and similar trends is noted in different part of the world (Kumar and Cannon, 2009) [3, 4].

National data on incidence and mortality of CAD are few in Bangladesh. More recent data indicates the coronary artery disease prevalence is 1.85% to 3.4% in rural population and it is 19.6% in an urban population [1].

Obesity has an association with all cause of mortality, cardiovascular disease (CVD), diabetes and is an important component of metabolic syndrome [5].

Central obesity is more strongly associated with CVD risk than general obesity. The deposition of adipose tissue is associated with systemic inflammation which has a direct effect on CAD risk [6].

Currently used general and central obesity anthropometric measures for assessing adiposity related risk include body mass index (BMI), waist circumference (WC), hip circumference (HC), waist-hip ratio (WHR) and waist-height ratio (WHtR) [6]. BMI is often used to reflect total obesity, whereas the WC, WHR and WHtR are used as surrogates for intra-abdominal adiposity [7].

Lakka *et al*., found abdominal obesity was an independent risk factor for coronary heart disease in middle-aged men and even more important than overall obesity [8]. In another study Kaur, Sharma and Singh demonstrated waist related anthropometric measures were important predictors of CAD risk factors among middle aged and older women, as compared to BMI [6].

In a cross sectional survey in Australian adults, Dalton et al. demonstrated that WHR was the most useful measures of obesity to use to identify individuals with CVD risks [9]. In a case-control study Yusuf et al. clearly demonstrated that of the various anthropometric measures commonly used, WHR showed the strongest relation with the risk of MI worldwide both in men and women across all ages and ethnic groups.

In a recent study done in Bangladesh, Bhowmik *et al*., found indices of central obesity better predicted cardiometabolic risk factors than general obesity defined by BMI for both men and women [7].

Non-ST-segment elevation myocardial infarction (NSTEMI) patients show greater heterogeneity than patients with STEMI who, as a group, present with a relatively predictable prognosis; however, either presentation is equally dangerous overall. There remains a lack of supporting evidence on the impact of central obesity on clinical outcomes in patients with NSTEMI presentations, especially when considering WHR [10].

In Bangladesh a study done by Sabah *et al*., found positive correlation between waist-to-height ratio and severity of coronary artery disease and also with BMI [11]. Another study done by Hossain *et al.*, where he also found significant association between waist–hip ratio (WHR) and the severity of CAD in patients with acute ST-segment elevation myocardial infarction (STEMI) patients [1].

OBJECTIVES

To evaluate the angiographic severity of coronary artery disease in patients with NSTEMI by Gensini score and \Vessel score.

METHODS

Study Design

Cross sectional observational study.

Place of Study

Department of Cardiology at National Institute of Cardiovascular Diseases (NICVD), Dhaka.

Study Period: April, 2018 to May, 2019.

Study population

Patients with NSTEMI who were underwent coronary angiography in National Institute of Cardiovascular Diseases (NICVD), Dhaka during specified period of time with matched inclusion and exclusion criteria.

Sampling method: Purposive sampling

Sample size: Total 100 patient were included in this study with 50 in each group.

Inclusion criteria:

NSTEMI patients admitted in cardiology department of NICVD, Dhaka who subsequently underwent Coronary Angiogram (CAG).

Exclusion criteria:

- STEMI patients.
- Patients with H/O previous percutaneous coronary Intervention (PCI) or coronary artery bypass grafting (CABG).
- Patients with systemic infection and non-cardiovascular diseases (like hepatic dysfunction, CKD, malignancy).
- Patients who had participated in weight-reducing programs (including diets) or received related medications.
- Patients unwilling to enrolled in the study.

Study procedure

Procedure for data collection:

All patients admitted with acute coronary syndrome in the department of cardiology, NICVD, fulfilling the inclusion and exclusion criteria were considered for the study. Total 100 patients were selected for data collection. They were divided into two groups, group I (Normal WHR, Male < 0.90, Female < 0.80) = 50 and group II (Increased WHR, Male ≥0.90, Female ≥0.80) = 50 according to inclusion and exclusion criteria.

Statistical Methods:

Data were analyzed by using SPSS version 25. (Statistical package for social science). Continuous data were expressed as mean ± SD. Dichotomous data were expressed as percentage. Comparison of continuous variables were done by unpaired t-test. Categorical data were analyzed with Chi-square (χ^2) test.

RESULT

This cross-sectional observational study was done at the National Institute of Cardiovascular Diseases (NICVD), Dhaka. The purpose of the study was to find out the association between Waist-Hip Ratio (WHR) and the severity of coronary artery disease in patients with non-ST-segment elevation myocardial infarction (NSTEMI) assessed by angiographically. A total of 100 patients with non-STEMI who agreed to undergo coronary angiography were included in the study.

Table 1: Distribution of the study patients according to vessel score (n=100)

Vessel Score	Group I (n= 50)		Group II (n=50)		p value
	Number	%	Number	%	
Score – 0	7	14.0	0	0.0	**0.02**[s]
Score – 1	29	58.0	12	24.0	**0.005**[s]
Score – 2	12	24.0	28	56.0	**0.001**[s]
Score – 3	2	4.0	10	20.0	**0.03**[s]

Group I: Patients with normal WHR
Group II: Patients with increased WHR
S=Significant (p<0.05), NS = Not significant (p>0.05)
p value reached from Fisher's Exact test and Chi Square test.

The above table shows distribution of the study patients according to vessel score. In this study patients with non critical CAD (14% vs 0%, *P* = 0.02) and single vessel disease (58% vs 24%, *P* = 0.005) were more frequent in Group I, on contrary double vessel disease (24% vs 56%, *P* = 0.001) and triple vessel disease (4% vs 20%, *P* = 0.03) were more frequent in patients of Group II with significant difference.

Table 2: Mean status of WHR of the study patients according to significant coronary artery disease defined by Gensini Score, (n=100)

WHR	Moderate to severe CAD (n=50) (GS≥36)	Normal to mild CAD (n=50) (GS<36)	p value
Mean ± SD	0.99±0.19	0.89±0.12	**0.004**[s]

S=Significant
p value reached from unpaired t test.

The mean WHR was found 0.99±0.19 and 0.89±0.12 in moderate to severe and normal to mild CAD respectively. The difference of mean WHR between the moderate to severe and normal to mild CAD groups was statistically significant (p=0.004).

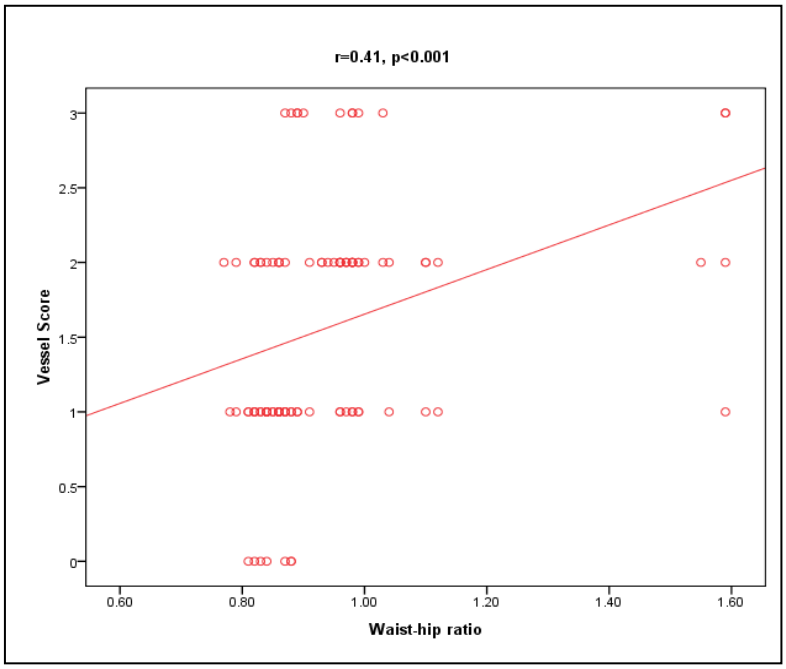

Figure 1: Correlation between WHR and vessel score

The figure depicts that there was a positive correlation between WHR and coronary artery disease severity in terms of vessel score (r=0.41). It was observed that the Spearman's rank correlation was statistically significant (p<0.001) by correlation t-test.

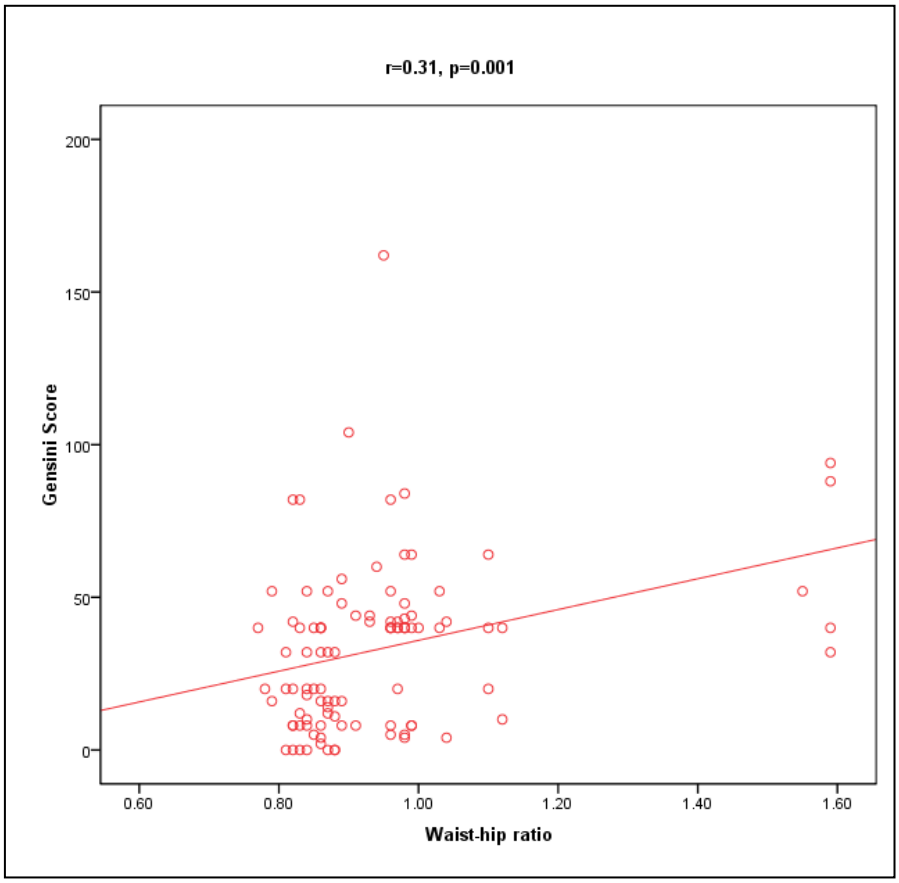

Figure 2: Correlation between WHR and Gensini score

The figure demonstrates that there was also a positive correlation between WHR and coronary artery disease severity in terms of Gensini score (r=0.31). It was observed that the Pearson's correlation was statistically significant (p=0.001) by correlation t-test.

Table 3: Multivariate regression of determinants of significant CAD (by Gensini Score)

Variables of interest	Regression coefficient (B)	OR	95% CI	p value
Waist Circumference	**0.398**	**1.37**	**1.045 – 8.290**	**0.04[s]**
Increased BMI	**0.504**	**1.52**	**1.021 – 7.912**	**0.02[s]**
Increased WHR	**0.812**	**3.45**	**1.229 – 12.979**	**0.01[s]**

Dependent variable: CAD;
Independent variables: waist circumference, BMI and increased WHR
S= Significant (p<0.05)

The above table depicts the multivariate logistic regression analysis of odds ratio (OR) for characteristics of the subjects likely to cause coronary artery disease severity. The variables revealed to be significantly associated with severe CAD by multivariate analysis were entered into the model directly. It was observed that waist circumference, increased BMI and increased WHR were found to be the significant predictors of severe CAD with ORs being 1.37, 1.52 and 3.45 respectively. Hence it can be concluded that increased WHR is significantly more associated to develop CAD in this study.

DISCUSSION

Among group II, highest percentage was of 2 vessel score (56%) followed by 1 vessel score 24%, 2 vessel score (20%) and none in 0 vessel score. On the contrary among group I, highest percentage was of 1 vessel score (58%) followed by 24% in 2 vessel score, 14% patients had 0 vessel score and 4% of 2 vessel score. 0 vessel involvement was found statistical association in both group (p=0.02). 1 vessel score significantly higher in group I (p=0.005) than group II. 2 vessel involvement was significantly higher in group

II than group I (p=0.001). Three vessel involvement was observed more in group II than group I with statistically significant (p=0.03).This result was comparable with the study of Rofiquzzaman [12].

The mean WHR of study patients according to the number of vessels involvement. The mean WHR of subjects with normal angiographic findings was 0.85±0.029. The mean WHR of single, double and triple vessel disease were 0.91±0.135, 0.97±0.162 and 1.05±0.259 respectively. The WHR increased in proportion with the number of vessel involved from no vessel involvement to triple vessel involvement and the differences were statistically significant (p=0.01). Ahmad, Khan and Khan found that the WHR was abnormally increased in 65% of patients with CAD, whereas only 34% were normal WHR were diagnosed to have CAD [5].

The mean Gensini Score was found 21.96±.19.72 and 44.18±28.91 in group I and group II respectively. The difference of mean Gensini Score between the group I and group II was statistically significant (p<0.001). Bakhoum *et al*., found that the mean Genseni's score was 85.1±38.5 vs 60.4 ± 43.6 in patints with or without abdominal obesity in terms of WC respectively that indicated that Genseni's score was higher in abdominal obese than normal population [13].

There was a positive correlation between WHR and coronary artery disease severity in terms of vessel score (r=0.41). It was observed that the Spearman's rank correlation was statistically significant (p<0.001). There was also a positive correlation between WHR and coronary artery disease severity in terms of Gensini score (r=0.31). It was observed that the Pearson's correlation was statistically significant (p=0.001). It was supported by the study of Ahmad, Khan and Khan and also by Parsa and Jahanshahi [5, 14].

Multivariate logistic regression analysis of odds ratio (OR) for characteristics of the subjects likely to cause coronary artery disease severity. The variables revealed to be significantly associated with severe CAD by multivariate analysis were entered into the model directly. It was observed that waist circumference, increased BMI and increased WHR were found to be the significant predictors of severe CAD with ORs being 1.37, 1.52 and 3.45 respectively. This result was compatible with the study of Parsa and Jahanshahi [14].

CONCLUSION

Significant positive correlation was observed between the vessel score and WHR. Similarly WHR levels were found to be higher in patients with high degree of angiographic stenosis in terms of Genseni's score. Multivariate Logistic regression analysis showed that a patient with increased WHR had 3.45 fold higher risk of having significant CAD compared with those with the normal WHR.

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