Association of Obesity Indices with Acute Myocardial Infarction

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Introduction
Obesity is a known risk factor for the development of myocardial infarction. The indices that are popularly used to express obesity are: Body mass index (BMI), waist-hip ratio, and waist circumference. The latter two are indicators of body fat distribution and has found to predict cardiometabolic risk independent of the BMI in both men and women.[¹-⁷]
This study aims to compare the association of BMI, waist-hip ratio and waist circumference with myocardial infarction.

Aims and Objectives
1. To find out difference in BMI and body fat distribution in patients with myocardial infarction as compared to those without myocardial infarction.
2. To compare the strength of association of BMI, waist-hip ratio and waist circumference with the occurrence of myocardial infarction.

Materials and Methods
Study Design
The study was designed to be a Case-control study and was conducted in a tertiary care centre in South Kerala. The minimum sample size was calculated from a previous study.[⁸] and was found to be 58.5. A total of 120 people were studied, of which 60 were cases and 60 were controls.

Cases
Patients admitted to the Department of Medicine with a diagnosis of acute Myocardial Infarction according to the WHO criteria, above the age group of 18 years.

Exclusion Criteria
1. Patients who were not fit for ambulation.
2. Those who do not give consent.

Controls
Bystanders of patients admitted to the institution who were comparable with the cases on the basis of age and gender.

Exclusion criteria
1. People with known coronary artery disease
2. Those who were not willing to give consent.

Data collection was with the help of questionnaire and was done only when the patients were fit for ambulation. Weight was measured using Tanita UM-081 BIA device, that gives weight measurement calibrated to 0.1 kg. Height was measured on a standard stadiometer. Waist Circumference was measured at the midpoint between the lowest point of the costal cartilage and the upper part of the iliac crest in the mid axillary line conforming to the WHO recommendations. Hip circumference was measured at the level of the largest circumference of the buttocks, confirming to the WHO recommendations. BMI was measured as (weight in kilograms)/(height in meters)$^2$. Waist – hip ratio is the waist circumference in centimeters divided by the hip circumference in centimeters. For hypertension, diabetes and dyslipidemia, self reporting was taken similar to the INTERHEART study.

Current smokers are defined by a regular habit of smoking at least 1 cigarette per day for at least 3 months within the past 6 months. Reformed smokers were not considered.

BMI cut offs were ≥23 in asian population. Waist circumference is considered abnormal if > 80 cms for females and > 90 cms for males.

Observations and Results

1. Age distribution of Cases and Controls: Since the anthropometric parameters vary with age, it is important to ensure that both the cases and controls are comparable with respect to age. The analysis given below shows that the cases and controls do not have any significant difference, with respect to the age. Chi square 5.099, df = 3, p value = 0.165.

Table 1: Age distribution of cases and controls

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Cases</th>
<th>Controls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>&lt; 50 years</td>
<td>10</td>
<td>16.7%</td>
<td>12</td>
</tr>
<tr>
<td>50-59 years</td>
<td>16</td>
<td>26.7%</td>
<td>20</td>
</tr>
<tr>
<td>60-69 years</td>
<td>20</td>
<td>33.3%</td>
<td>23</td>
</tr>
<tr>
<td>≥70 years</td>
<td>14</td>
<td>23.3%</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100%</td>
<td>60</td>
</tr>
</tbody>
</table>

Since anthropometric parameters vary with gender as well, comparability should be ensured with respect to the number of subjects from each gender.

Table 2: Gender distribution of cases and controls

<table>
<thead>
<tr>
<th>GENDER</th>
<th>Cases</th>
<th>Controls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Male</td>
<td>43</td>
<td>71.7%</td>
<td>43</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>28.3%</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>60</td>
<td>100%</td>
<td>60</td>
</tr>
</tbody>
</table>

(Chi square 0.000, df=1 . p value 1.000)

The table shows that the cases and the controls were comparable.
Abnormal waist circumference was found to be significantly higher in cases when compared to controls. (Chi square 29.4, df=1, p value <0.001) and was found to be strongly associated with myocardial infarction. (Odds ratio 11.769, 95% CI 4.391-31.546).

Abnormal waist hip ratio was also found to be significantly higher in cases when compared to controls. (chi square 22.282, df=1, p value <0.001). There was a strong association between abnormal waist hip ratio and myocardial infarction. (Odds ratio 18.027, CI= 4.102-81.002).
Abnormal BMI was found to be significantly higher in cases when compared to controls (Chi square 17.368, df=1; p value<0.001) and was found to be strongly associated with myocardial infarction.

Table 3: Multivariate Analysis

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig</th>
<th>Exp(B)</th>
<th>95% CI for Exp(B) Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal waist circumference</td>
<td>.961</td>
<td>.691</td>
<td>1.757</td>
<td>1</td>
<td>.185</td>
<td>.645</td>
<td>9.685</td>
<td></td>
</tr>
<tr>
<td>Abnormal waist-hip ratio</td>
<td>1.86</td>
<td>.843</td>
<td>4.872</td>
<td>1</td>
<td>.027</td>
<td>1.232</td>
<td>33.556</td>
<td></td>
</tr>
<tr>
<td>Abnormal BMI</td>
<td>-.060</td>
<td>.648</td>
<td>.009</td>
<td>1</td>
<td>.926</td>
<td>.265</td>
<td>3.35</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.81</td>
<td>.471</td>
<td>14.853</td>
<td>1</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Multivariate analysis of the anthropometric parameters showed waist hip ratio to be significantly associated with myocardial infarction. P value <0.05.

Discussion

Abnormal body mass index, waist circumference and waist hip ratio were associated with myocardial infarction. This has been conclusively proven by studies from India and abroad\cite{6,10,11}. Several previous studies including the large multi centre land mark INTERHEART study has found that waist hip ratio is more significant than the waist circumference in cardiovascular risk assessment, similar to the results in our study\cite{5,12}.

Multivariate analysis of anthropometric parameters showed that waist hip ratio to be significantly associated with a risk of myocardial infarction.

Our study therefore concludes that waist hip ratio measurement may obviate the need for any other measures of corpulence or obesity.

References

6. Leitzmann MF et al. waist Circumference as compared with body mass index in predicting mortality from specific causes. Plos one;2011: 6 e 18582.