Risk Factors for Acute Myocardial Infarction in Goa, India: A Case Control Study

AM Ferreira¹, S R Shiolkar¹, FS Vaz¹, NR Pinto¹, SG Perni¹, MS Kulkarni¹

ABSTRACT

Introduction: Myocardial infarction is turning to be a significant health problem in India along with other lifestyle diseases. The risk factors identified included sedentary lifestyle, cigarette smoking, hypertension, dyslipidaemia and diabetes mellitus. The excess risk of coronary heart disease in Indians appears to be greater at younger ages, while some features and risk factors of coronary heart disease in India are peculiar. The state of Goa boasts of a westernized and urbanized culture is conducive to development of any of the lifestyle diseases. Study objectives were to study certain risk factors associated with acute myocardial infarction in Goa, India

Material and methods: A hospital based case-control study was conducted at a tertiary care hospital in Goa, India. Age and sex matched cases and controls (group matching) in the ratio of 1:1 constituted the study sample. Cases of acute myocardial infarction were defined as per the MONICA criteria. Interview was carried at patient’s bed side using a predesigned structured questionnaire. In addition, blood pressure measurements, anthropometric measures, ECG and laboratory investigations were done. Approval for the study was obtained from the Institutional Ethics Committee of the Institute prior to the conduct of the study. Statistical analysis was carried using SPSS software package version 21.0. Statistical tests included odds ratio with 95% confidence interval, chi square test and t test. Multiple logistic regression analysis (step wise forward method) was used to examine the independent effect of different risk factors.

Results: Smoking (OR=3.59; 95% CI: 2.25-5.73) and Alcohol use (OR=2.98; 95% CI: 1.8-4.9) were found to be significantly associated with acute myocardial infarction. The risk of developing acute myocardial infarction increased with the number of drinks consumed per day and number of cigarettes smoked per day. Similarly, hypertension (OR=3.3; 95%CI:2.18-5.0), diabetes mellitus (OR=3.06; 95% CI: 2.0-4.7), obesity (OR=1.91; 95% CI: 1.18-3.10) and low physical activity (OR=1.81; 95% CI: 0.96-3.42) were also identified as significant risk factors for myocardial infarction. On multiple logistic regression analysis, current smoking, number of cigarettes smoked per day, duration of smoking, frequency of smokeless tobacco per day, number of alcohol drinks per day, hypertension, diabetes mellitus and obesity were identified as significant independent risk factors for acute myocardial infarction.

Conclusion: Considering the risk factors identified in the study there is an urgent need to develop policy measures to promote healthy life style habits. Such measures could include risk factor interventions among those with risk factors, health education campaigns for the general public and development of a comprehensive healthcare programme.

Keywords: Myocardial Infarction, India, Risk Factors, Tertiary Care Hospital, Logistic Regression

INTRODUCTION

Globally, cardiovascular disease made up 30 per cent of global deaths according World Health Report 2015¹, over 20 per cent of these deaths occurred in low and middle income countries. The World Health Organisation further estimates that, at least 80% of premature deaths from heart disease and stroke could be avoided through healthy diet, regular physical activity and avoiding tobacco smoke.² The south Asian countries of India, Pakistan, Bangladesh, Sri Lanka and Nepal contribute the highest proportion of the burden of myocardial infarction compared to any other regions globally.³ Risk factors for myocardial infarction were for the first time well established by the Framingham Heart Study, USA.⁴ The risk factors identified included sedentary lifestyle style, cigarette smoking, hypertension, dyslipidaemia and diabetes mellitus. The excess risk of coronary heart disease in Indians appears to be greater at younger ages, while some features and risk factors of coronary heart disease in India are peculiar.⁵ The state of Goa boasts of a westernized and urbanized culture is conducive to development of any of the lifestyle diseases. Therefore, it was imperative to undertake this case control study to identify risk factors for acute myocardial infarction in Goa, India.

MATERIAL AND METHODS

The hospital based case-control study was conducted at a tertiary care hospital in Goa, India. Age and sex matched cases and controls (group matching) in the case: control ratio of 1:1 constituted the study sample. The study was conducted over a period of one year.

Sample size was calculated using the formula: ² n = (Z₁-α/2 + Z₁-β)² p q (r+1)/ (P1-P2)² r
Where, α =0.05 and β=0.2, and for these values of type I and type II errors, the values of power of detecting these errors are as under; Z₁-α/2=1.96 and Z₁-β=0.84. Proportion of smokers among the cases in previous studies⁶ P₁=0.55 and proportion of smokers among the controls in previous studies P₂=0.38. Similarly p = (P₁+P₂)/2=0.465 and q =1-p=0.535.

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Risk Factors for Acute Myocardial Infarction

RESULTS

Two hundred cases with equal number controls matched for age and sex constituted the study sample. The mean age of cases and controls was 58.3±11.5 years; it was 56.5±10.4 for male participants compared to 65.0±11.5 among female participants. Majority of the cases (75.5%) and controls (70.5%) were Hindus followed by Christians and Muslims. As regards educational status, majority of cases (33.0%) and controls (35.5%) were illiterate followed by those educated up to secondary school. In terms of socioeconomic status, majority of cases (55.5%) and control (50.5%) were in the socioeconomic class III of BG Prasad classification.

Table 1 describes risk factors for acute myocardial infarction like tobacco use and alcohol use. As regards tobacco smoking was current smokers were 3.5 times at risk of developing acute myocardial infarction compared to non-smokers (OR=3.59; 95% CI: 2.25-5.73). The odds of getting an acute myocardial infarction increased with the increasing number of cigarettes smoked per day. The highest odds ratio was observed for those smoking 20 or more cigarettes per day (OR=11.42; 95% CI: 3.93-33.16) compared to non-smokers.

As regards duration of smoking, the risk of acute myocardial infarction increased with increasing duration of smoking. Use of smokeless tobacco was found to increase the risk of acute myocardial infarction (OR=1.92; 95% CI: 1.1-3.35). Those consuming smokeless tobacco 5-8 times per day were almost five times at risk of developing acute myocardial infarction compared to those consuming 1-4 times per day (OR=5.4; 95% CI: 1.67-17.5).

Alcohol intake was found to be significantly associated with acute myocardial infarction (p<0.0001, OR=2.98; 95% CI: 1.8-4.9). This risk of developing acute myocardial infarction increased with the number of drinks consumed per day, with those having 9-12 standard drinks per day being 6.49 times more likely to suffer from acute myocardial infarction (OR=6.49; 95% CI: 0.75-56.21) compared to non-smokers.

Table 2 describes risk factors for acute myocardial infarction (continued...).
infarction (p=0.031).

Table 3 describes risk factors like hypertension, diabetes mellitus, obesity and physical activity. Hypertensives were three times more likely to develop acute myocardial infarction compared to normotensives (OR=3.3; 95% CI: 2.18-5.0); Similarly, those suffering from diabetes mellitus were at higher risk of developing acute myocardial infarction (OR=3.06; 95% CI: 2.0-4.7). Obesity was identified as a significant risk factor for myocardial infarction, with overweight (OR=1.91; 95% CI: 1.18-3.10) and obese individuals (OR= 2.48; 95% CI: 1.07-5.77) at higher risk compared to those with normal weight according to BMI. Individuals involved in low physical activity were at almost twice at risk of developing acute myocardial infarction compared to those engaged in high level of physical activity (OR=1.81; 95% CI: 0.96-3.42). As regards lipid profiles, those with raised cholesterol levels (OR=2.31; 95% CI: 1.5-3.5), raised triglyceride levels (OR=1.57; 95% CI: 1.06-2.35), raised LDL levels (OR=1.53; 95% CI: 1.03-2.27) and low HDL levels (OR=2; 95% CI: 1.32-3.03) were at higher risk of developing acute myocardial infarction compared to those with normal levels.

Table 4 describes results of multiple logistic regression analysis of risk factors of myocardial infarction using stepwise forward method. Current smoking, number of cigarettes smoked per day, duration of smoking, frequency of smokeless tobacco per day, number of alcohol drinks per day, hypertension, diabetes mellitus and obesity were identified as significant independent risk factors for acute myocardial infarction.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Cases No. (%)</th>
<th>Controls No. (%)</th>
<th>Odds ratio (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>83 (41.5%)</td>
<td>33 (16.5%)</td>
<td>3.59 (2.25-5.73)</td>
<td>0.000001</td>
</tr>
<tr>
<td>No</td>
<td>117 (58.5%)</td>
<td>167 (83.5%)</td>
<td>1 (ref)</td>
<td></td>
</tr>
<tr>
<td>No. of cigarettes smoked per day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>117 (58.5%)</td>
<td>167 (83.5%)</td>
<td>1 (ref)</td>
<td></td>
</tr>
<tr>
<td>1-9</td>
<td>16 (8%)</td>
<td>17 (8.5%)</td>
<td>1.34 (0.65-2.77)</td>
<td>0.006</td>
</tr>
<tr>
<td>10-19</td>
<td>35 (17.5%)</td>
<td>12 (6%)</td>
<td>4.16 (2.07-8.36)</td>
<td></td>
</tr>
<tr>
<td>20 and above</td>
<td>32 (16%)</td>
<td>4 (2%)</td>
<td>11.42 (3.93-33.16)</td>
<td></td>
</tr>
<tr>
<td>Duration of smoking (Years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>117 (58.5%)</td>
<td>167 (83.5%)</td>
<td>1 (ref)</td>
<td>0.000001</td>
</tr>
<tr>
<td>1-9</td>
<td>2 (1%)</td>
<td>10 (5%)</td>
<td>0.29 (0.06-1.33)</td>
<td></td>
</tr>
<tr>
<td>10-19</td>
<td>20 (10%)</td>
<td>16 (8%)</td>
<td>1.78 (0.89-3.590)</td>
<td></td>
</tr>
<tr>
<td>20 and above</td>
<td>61 (30.5%)</td>
<td>7 (3.5%)</td>
<td>5.44 (2.99-9.91)</td>
<td></td>
</tr>
<tr>
<td>Alcohol use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69 (34.5%)</td>
<td>30 (15%)</td>
<td>2.98 (1.8-4.9)</td>
<td>0.00001</td>
</tr>
<tr>
<td>No</td>
<td>131 (65.5%)</td>
<td>170 (85%)</td>
<td>1 (ref)</td>
<td></td>
</tr>
<tr>
<td>No. of standard drinks consumed per day</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>131</td>
<td>170</td>
<td>1 (ref)</td>
<td>0.000004</td>
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<tr>
<td>1-4</td>
<td>14</td>
<td>15</td>
<td>1.21 (0.56-2.60)</td>
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</tr>
<tr>
<td>5-8</td>
<td>50</td>
<td>14</td>
<td>4.63 (2.46-8.75)</td>
<td></td>
</tr>
<tr>
<td>9-12</td>
<td>5</td>
<td>1</td>
<td>6.49 (0.75-56.21)</td>
<td></td>
</tr>
</tbody>
</table>

Table-2: Association of tobacco and alcohol use with myocardial infarction

Table-3: Risk factors for myocardial infarction
DISCUSSION

Factors like tobacco and alcohol use were found to be significant risk factors for acute myocardial infarction. Those currently smoking were 3.5 times at risk of developing acute myocardial infarction compared to non-smokers (OR=3.59; 95% CI: 2.25-5.73). Meenakshisundaram R et al reported an odds ratio of 4.59 for the association between smoking and acute myocardial infarction in their study in the South Indian population. Similarly, Patil S. et al reported the odds ratio for smoking and acute myocardial infarction to be 2.07 (95% CI: 1.12-3.82). On the other hand Tilak AH. et al reported 1.55 times higher risk of acute myocardial infarction among smokers compared to non-smokers (OR=1.55; 95% CI: 1.28-1.89).

The risk of acute myocardial infarction increased with the increasing number of cigarettes smoked per day and also with increasing smoke years. Rohit VR. et al reported odds ratio of 3.72 (95% CI: 1.46-9.60) for acute myocardial infarction among those smoking more than ten cigarettes per day while, Pais P et al reported that those smoking more than ten cigarettes per day were 6.7 times more likely to suffer from acute myocardial infarction compared to non-smokers (OR=6.7; 95% CI: 3.51-12.8) Use of smokeless tobacco was found to increase the risk of acute myocardial infarction (OR=1.92; 95% CI: 1.1-3.35). Rohit VR. et al also reported similar findings among smokeless tobacco users (OR=2.06; 95% CI: 1.21-3.49).

Alcohol intake was found to be significantly associated with acute myocardial infarction (p<0.0001, OR=2.98; 95% CI: 1.8-4.9). Rohit VR. et al reported odds ratio of 2.31 (95% CI: 1.02-5.33) for developing acute myocardial infarction among alcohol users while Anand S. et al reported odds ratio of 0.88 (95% CI: 0.82-0.94) among alcohol users. The risk of developing acute myocardial infarction increased with the number of drinks consumed per day while, duration of alcohol consumption was also found to be significantly associated with acute myocardial infarction.

Similarly, hypertension (OR=3.3; 95% CI: 2.18-5.0), diabetes mellitus (OR=3.06; 95% CI: 2.0-4.7), obesity (OR=1.91; 95% CI: 1.18-3.10) and low physical activity (OR=1.81; 95% CI: 0.96-3.42) were also identified as significant risk factors for myocardial infarction. Meenakshisundaram R. et al reported odds ratio of 9.59 (95% CI: 7.34-12.52) for the association between hypertension and acute myocardial infarction and an odds ratio of 7.87 (95% CI: 5.95-10.41) for the association of diabetes mellitus with acute myocardial infarction. Similarly Anand S. et al found the odds ratio of 2.95 (95% CI: 2.66-3.28) for hypertension and odds ratio of 4.26 (95% CI: 3.68-4.94) for diabetes mellitus in their association with acute myocardial infarction. As regards physical activity, Rohit V et al in their study found low physical activity as risk for acute myocardial infarction (OR=3.57; 95% CI: 1.58-8.23).

On multiple logistic regression analysis, current smoking, number of cigarettes smoked per day, duration of smoking, frequency of smokeless tobacco per day, number of alcohol drinks per day, hypertension, diabetes mellitus and obesity were identified as significant independent risk factors for acute myocardial infarction.

CONCLUSION

Considering the risk factors identified in the study there is an urgent need to develop policy measures to promote healthy lifestyle habits. Such measures could include risk factor interventions among those with risk factors, health education campaigns for the general public and development of comprehensive healthcare programme.

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