Risk Factors of Recurrent Myocardial Infarction among Patients with Myocardial Infarction Attending a Tertiary Care Hospital Thiruvananthapuram: A Hospital-Based Case Control Study

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Abstract: *Recurrent Myocardial Infarction (ReMI) is the recurrence of signs and symptoms of ischemia in patients with previously diagnosed Myocardial Infarction. Patients who survive acute Myocardial Infarction in the acute phase remain at risk for recurrent episodes. The incidence of ReMI per year was 2.65 % for the first year, and 0.912 - 1.42 % thereafter upto 5 years. Hence identifying the risk factors associated with recurrent Myocardial Infarction is important to prevent further episodes. The objective of the present study was to assess the risk factors of recurrent Myocardial Infarction among patients with Myocardial Infarction attending Department of Cardiology, Medical College Hospital, Thiruvananthapuram. A hospital - based Case Control design was adopted for the present study. The sample consisted of 117 cases and 117 controls. The sample were selected concurrently who satisfied the inclusion criteria. Sociodemographic data and clinical data were assessed using semi structured interview schedule, record review and physical assessment. Univariate and multivariate logistic regression analysis were performed to identify the risk factors associated with ReMI. Univariate analysis revealed that increasing age, smoking, increasing Body Mass Index, increasing low - density lipoprotein levels and non - adherence to medication were the risk factors of ReMI. Multivariate analysis using binary logistic regression revealed that increasing age (OR = 3.13), smoking (OR = 2.54), increasing Body Mass Index (OR = 2.34) and non - adherence to medication (OR = 21.08) were the significant risk factors of ReMI. Assessing the risk factors associated with ReMI will ultimately help in adopting comprehensive strategies to prevent the ReMI.*

Keywords: Risk factors; patients with Myocardial Infarction; Recurrent Myocardial Infarction; secondary prevention.

1. Introduction

Cardio Vascular diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32 % of all global deaths. Of these deaths, 85 % were due to Myocardial Infarction (MI).[1] Around 10% of all Myocardial Infarction patients are at risk of developing a recurrent Myocardial Infarction within next year.[2] Recurrent Myocardial Infarction is still a very common complication faced by the patients with a history of MI, despite the progress in new therapeutic modalities and introduction of more efficient pharmacotherapy and stents.[3] In our setting most of the patients coming to Department of Cardiology are for MI management. The survivors who attended the Department of Cardiology, reported recurrent episodes and readmissions after the index MI. It is very necessary to take prompt interventions even after discharge from hospital and more emphasis should be given for reducing the risk factors. Hence the present study should focus on early identification of the risk factors of recurrent MI and thereby reducing chances of further episodes, readmissions and potential complications. By assessing the risk, the health care workers in the hospital and community areas will be able to create awareness about secondary prevention which in turn can reduce further complication and mortality among Myocardial Infarction survivors. Hence this study is the need of the hour in order to get a data of risk factors of recurrent Myocardial Infarction in our setting and which contribute to take appropriate measures to manage this condition.

2. Materials and Methods

2.1 Study design

The research design adopted for this study is a hospital-based Case Control design. In Case Control design, causes of a disease are investigated after the occurrence of the disease.

2.2 Sample characteristics

The sample for the present study consisted of 117 cases and 117 controls with clinical diagnosis of Myocardial Infarction selected concurrently. Inclusion criteria of the present study were adult patient ≥ 40 years with recurrent Myocardial Infarction and patients who are willing to participate.

2.3 Tools

A semi structured interview schedule, perceived stress scale and medication adherence scale were used for data collection. Semi structured interview schedule used to assess the socio demographic data and clinical data. Tools for measuring anthropometric measurement (weight, height, hip circumference and waist circumference) includes weighing machine and measuring tape. The blood pressure was

measured using Sphygmomanometer. Perceived stress scale scores from 0 to 16, with higher scores representing higher levels of stress. It categorized into three levels low stress (< 6), moderate stress (6 - 8), high perceived stress (9 - 16).[4] The value of compliance can be interpreted with high compliance with score 25, moderate compliance with the total value of score 6 - 24, and low compliance with score 1 - 5 scores.

2.4 Data collection process

The data collection period was 6 weeks. The researcher obtained prior formal permission for data collection from concerned areas. The data collection period was from 1/6/2023 to 8/7/2023. The study group consisted of 117 cases and 117 controls. Informed consent was taken from patients. Cases and controls were concurrently selected from among the participants who met the inclusion criteria. The investigator met each subject individually, established rapport with them and the purpose of the study was explained to them. It was explained to them that all the data would be kept strictly confidential and used for only study purpose.

After obtaining the verbal and written consent from the patients, the data were collected from each participant. With the help of semi structured interview schedule, record review and physical assessment, the investigator collected data from patient attending cardiology OPD and ICU - both case and control concurrently. Body Mass Index of each patient was calculated by collecting their height and weight. The blood pressure was measured using Sphygmomanometer. Stress was assessed by Perceived Stress Scale-4, non- adherence to medication-by-Medication Adherence Scale. It took about 15 minutes to collect data from each patient.

3. Results

The present study was undertaken to identify the risk factors of recurrent Myocardial Infarction among patients with Myocardial Infarction.

Major findings of the study are presented under the following sections.

3.1 Socio demographic data

Among the participants, 54.7% of cases and 73.5% of controls were in the age group of < 65years and 45.3% of cases and 26.5 % of controls were in the age group of ≥ 65 years. Regarding gender 74.4 % of cases and 82.9 % of controls were males, 25.6 % of cases and 17.1 % of controls were female. Based on education 2.5% of cases had no formal education, 24.7% of cases and 40.3% of controls had primary education, 40.3% of cases and 35 % controls had high school education, 24.7% of cases and 20.5% of controls had higher secondary education, 3.4% of cases and 4.2% of controls had professional education and 4.4% cases were graduate. On the basis of occupation 0.8 % of cases and 2.5 % of controls were professionals, 18.8% of cases and 17.1 % controls were skilled workers, 19.1 % of cases and 12 % of controls were semiskilled workers, 0.8 % each of cases and controls were unskilled workers and 45.4 % of cases and 36.1% of controls were unemployed. Among the participants, 40.2 % of cases and 37.6 % of controls belonged to APL category, 59.8 %

cases and 62.4 % controls belonged to the BPL category. Based on marital status, 8.2% of cases and 4.3% of controls were single, 72.6% of cases and 80.3 % of controls were married and 19.2 % of cases and 15.4 % of controls were widow/widower.

3.2 Clinical data

Regarding the presence of family history of Myocardial Infarction, 53.3 % of cases and 55.5 % of controls had family history of Myocardial, 60.7 % of cases and 42.7 % of controls had smoking habit. Among the participants, 2.6 % of cases and 3.4 % of controls had the habit of snuffing. Regarding presence of associated disease conditions 64.1 % of cases and 56.4 % of controls had diabetes mellitus, 85.5 % of cases and 87.2 % of controls had hypertension (100 % each of cases and controls were taking antihypertensives). Among the participants, 100 % of cases and 93.2 % of controls were taking statins. Regarding sample characteristics, 41% of cases and 60.7% of controls had BMI of less than 25Kg/m², 59% of cases and 39.3 % of controls had BMI of 25 Kg/m² or more, 15.4 % of cases and 17.1 % of controls had Waist Hip Ratio less than 8.5, 84.6 % of cases and 82.9 % of controls had Waist Hip Ratio of 8.5 or more, 59.8 % of cases and 65.8 % of controls had blood pressure of less than140/90mmHg, 40.2 % of cases and 34.2 % of controls had blood pressure of 140/90 mmHg or more, 75.2 % of cases and 84.6 % of controls had fasting blood glucose level of less than 126 mg/dL, 24.8 % of cases and 15.4 % of controls had fasting glucose level of 126 mg/dL or more34.2 % of cases and 32.5 % of controls had total cholesterol of ≥ 200 mg/dL, 23.9 % of cases and 25.6 % of controls underwent thrombolytic therapy, 21.5% of cases and 29.1% of controls underwent anticoagulants therapy, 52.9 % of cases and 45.3 % of controls underwent Percutaneous Coronary Intervention and 1.7 % of cases underwent Coronary Artery Bypass Graft in index Myocardial Infarction. Regarding the perceived stress level of participants, 52.1 % of cases and 45.2% of controls had high stress, 35.1 % each of cases and controls had moderate stress and 12.8 % of cases and 19.7 % of controls had low stress. Among the participants, 10.4 % of cases and 5.1 % of controls had high medication adherence, 88.8 % of cases and 85.5 % of controls had moderate medication adherence and 0.8 % of cases and 9.4 % of controls had low medication adherence.

3.2 Risk factors of recurrent Myocardial Infarction

Compared to participants with age < 65 years, those with age ≥ 65 years having 2.3 times more odds to have recurrent MI (CI, 1.33 - 3.98) and statistically significant (p = 0.003) , smokers having 2.07 times more odds to have recurrent MI (CI, 1.23 - 3.48) compared to non -smokers (p value 0.006), those with BMI less than 25 Kg/m² compared with BMI ≥ 25 Kg/m² have 2.22 times more risk to have recurrent MI (CI, 1.32 - 3.74) (p value 0.003), Low density lipoprotein level < 70mg/dL compared to those with a low density lipoprotein level ≥ 70 mg/dL have 1.8 times more risk to have recurrent Myocardial Infarction (CI, 1.03 - 3.13)(p = 0.037), those with high medication adherence compared those with low medication adherence 12 times more risk to have recurrent Myocardial Infarction (CI, 1.53 - 94.83)(p = 0.003), there is statistically significant association between recurrent

Myocardial Infarction and Statin intake with p value at 0.004 level.

There is no statistically significant association between recurrent Myocardial Infarction and Gender (p = 0.111), Family history of Myocardial Infarction (p = 0.791), Snuffing habit (p = 0.071), Diabetes mellitus (p = 0.229), Hypertension (p = 0.704), Duration of statin intake (OR = 0.391, CI, 0.19 – 0.78), Waist Hip Ratio (p = 0.723), Blood pressure (p = 0.344), Fasting Blood Sugar level (p = 0.073), Reperfusion therapies during Index Myocardial Infarction (p = 0.246), Perceived stress (p = 0.325) Lipid profile (Total cholesterol, Triglyceride, HDL and Total cholesterol and HDL level) with p value 0.782, 0.135, 0.893 and 0.648 respectively.

3.3 Association between selected risk factors and recurrent Myocardial Infarction

Compared to those with age < 65 years, those with age $\geq$ 65 years having 3.13 times more odds to have recurrent Myocardial Infarction. Smokers having 2.54 times more likely to have recurrent Myocardial Infarction than non-smokers. With regard to Body Mass Index, those with $\geq$ 25 Kg/m^2 had 2.34 times more chance to have recurrent Myocardial Infarction, than those with < 25 Kg/m^2. Those with low adherence to medication had 21.08 times more chance to have recurrent Myocardial Infarction, than those with high medication adherence.

Binary logistic regression analysis showed that, increased age, smoking, increased Body Mass Index and non-adherence to medication were found to be risk factors of recurrent Myocardial Infarction among patients with Myocardial Infarction.

4. Discussion

The present study was conducted to identify the risk factors of recurrent Myocardial Infarction. The risk factors were studied age, gender, family history, smoking, diabetes mellitus, hypertension, dyslipidemia, overweight, stress, non - adherence to medication and type of treatment during in index MI. After the multivariate analysis it is found that age ($\geq$ 65 years), smoking habit, Body Mass Index ($\geq$ 25 Kg/m^2) and non - adherence to medication were the major risk factors of recurrent Myocardial Infarction. Other risk factors are not found to be statistically significant in this study population. Numerous studies have been done to explore the risk factors for recurrent MI in various settings. A study conducted in England found that older age was associated with higher recurrence risk of MI.[5] Another study conducted in Western Australia identified, increasing age was associated with major adverse cardiac events .[6] A study conducted in United Arab Emirates, showed that age was significant predictor of recurrent Cardiovascular events. Independent predictors of recurrent CVD events or death include age, smoking, dyslipidemia, and the underutilization of medications.[7] A study conducted in United States, reported that early recurrent Myocardial Infarction had a higher prevalence of smoking and dyslipidemia.[8]

5. Conclusion

In univariate analysis it is found that major risk factors associated with recurrent Myocardial Infarction were increasing age, smoking, statin intake, duration of statin intake, increasing Body Mass Index, increasing low density lipoprotein level and non-adherence to medication. After Binary logistic regression it is found that major risk factors of recurrent Myocardial Infarction among patients with Myocardial Infarction attending Department of Cardiology, Govt. Medical College Hospital were increasing age, smoking, increasing Body Mass Index and non-adherence to medication.

Conflict of Interest
Not available

Financial support
Not available

References

[1] Cardiovascular diseases (CVDs) [Internet]. [cited 2023 Jul 3]. Available from: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds). Date of Accession 2023-07-03.

[2] Bruce SA. The association between central fat distribution and recurrent cardiovascular disease events in female survivors of nonfatal myocardial infarction. J Cardiovasc Nurs. 2015 Mar-Apr; 30(2): E15 - 22.

[3] Mal K, Awan ID, Shaukat F. Evaluation of Risk Factors associated with reinfarction: A Multicenter observational study. Cureus 2019 Nov 3;11(11): e6063.

[4] Perceived-Stress-Scale-4.pdf [Internet]. [cited 2023 Jul 13]. Available from: https://ohnurses.org/wp-content/uploads/2015/05/Perceived-Stress-Scale-4.pdf. Date on accession 13/7/2023.

[5] Li S, Peng Y, Wang X, Qian Y, Xiang P, Wade SW, et al. Cardiovascular events and death after myocardial infarction or ischemic stroke in an older Medicare population. Clin Cardiol. 2019 Feb 25; 42(3):391 - 9.

[6] Nedkoff L, Briffa T, Murray K, Gaw J, Yates A, Sanfilippo FM, et al. Risk of early recurrence and mortality in high-risk myocardial infarction patients: A population- based linked data study. Int J Cardiol Cardiovasc Risk Prev. 2023 Jun; 17:200185.

[7] Govender RD, Al-Shamsi S, Soteriades ES, Regmi D. Incidence and risk factors for recurrent cardiovascular disease in middle-eastern adults: a retrospective study. BMC Cardiovasc Disord. 2019 Nov 11; 19(1):253.

[8] Nair R, Johnson M, Kravitz K, Huded C, Rajeswaran J, Anabila M, et al. Characteristics and outcomes of early recurrent Myocardial Infarction after acute Myocardial Infarction. J Am Heart Assoc. 2021 Aug 17; 10(16): e019270.