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Patterns of Perception of Cardiac Symptoms by Patients Presenting with ST-Segment Elevation Myocardial Infarction and their Knowledge of Coronay Artery Disease Risk Factors

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ABSTRACT

Background: Proper knowledge regarding Coronary Artery Disease and their risk factors is essential for the early recognition of the disease and its presentation. This study was conducted to identify pattern of clinical symptoms and knowledge regarding Coronary Artery Disease risk factors among ST-Elevation myocardial infarction (STEMI) patients.

Methods: This cross-sectional, observational study was conducted among 340 ST-Elevation myocardial infarction patients in the inpatient Cardiology Department of Shahid Gangalal National Heart Centre Nepal, from November 2020 to February 2021. Baseline clinical characteristics, knowledge regarding Coronary Artery Disease risk factors, patterns of symptoms, and prehospital delay were collected and evaluated.

Results: In our study, 299 (87.9%) had typical ischemic chest pain during the symptom onset, however, only 81 (23.8%) perceived chest pain as cardiac disease, and 311 (91.5%) of the patients presented to the nearby health care center within the recommended time of less than 12 hours for the reperfusion therapy of ST-Elevation myocardial infarction. Perception of symptoms as a cardiac origin and typical chest pain were not significantly associated with earlier presentation. Also, the typical chest pain was not significantly associated with the perception of the symptom as a cardiac origin. The history of Coronary Artery Disease was considered as a Coronary Artery Disease risk factor by 184(54.1%) of the study population and 137(40.3%), 132(38.8%), 110(32.4%), 105(30.9%) and 71(20.9%) considered hypertension, smoking, age, obesity, and diabetes mellitus as a Coronary Artery Disease risk factor respectively.

Conclusions: Though most patients presented with typical chest pain, identification of the chest pain as a cardiac origin and the awareness of the Coronary Artery Disease risk factors was low.

Keywords: Coronary artery disease; perception; risk factors; ST-elevation myocardial infarction; symptoms

INTRODUCTION

ST-Elevation myocardial infarction (STEMI)-registry data from Nepal demonstrated that approximately 65% of the STEMI patients presented late and were not treated with early reperfusion therapy.[1] Delay from myocardial infarction (MI) symptom onset to seek medical care is an important factor of a success of STEMI treatment and the delay is potentially avoidable.

The prehospital delay includes the time required for recognizing the presence of symptoms, attributing it to a medical condition, deciding to seek medical care, and reaching the hospital.[2] These delays had been identified as a major obstacle to the more widespread use of appropriate and prompt reperfusion therapy.[3] There seems to be a paucity of these information in general population in our country.[4]

In this study, we aimed to explore how patients perceived symptoms of myocardial ischemia and their knowledge regarding risk factors of STEMI. We also

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aimed at identifying demographic factors, knowledge of perceived symptoms as ischemic pain and time required to present to nearby health center.

METHODS

This cross-sectional, observational study was conducted in the inpatients of Cardiology Department of Shahid Gangalal National Heart Centre (SGNHC) from November 2020 to February 2021. Using the prevalence (P) of 68% from a study conducted by Puymirat et al in France, the precision (d) of 5% and 95% confidence interval, the sample size was calculated to be 335. Considering non-response rates, we selected 340 patients for the study. All the patients admitted to the center with the diagnosis of acute STEMI were included in the study. Inclusion criteria were hemodynamically stable acute STEMI patients who were more than 18 years of age. Exclusion criteria were clinically unstable patients and those who could not convey their symptoms and knowledge.

The study was conducted after the ethical approval from the Institutional Review Committee of SGNHC (proposal approval number: 23-2020), and informed consent was obtained from all the participants. All patients admitted with the diagnosis of acute STEMI fulfilling the inclusion criteria were enrolled. Baseline clinical characteristics such as age, sex, socioeconomic status, and risk factors such as smoking, hypertension, diabetes mellitus, family history of Coronary Artery Disease (CAD), history of CAD, and body mass index (BMI) were collected. The time interval between the onset of Acute Myocardial Infarction (AMI) symptoms and the action taken for seeking medical care and time to reach the nearby health care center were also inquired. All the participants who gave consent were included in the study and were interviewed by trained research assistants. Face to face interview was conducted at the bedside, maintaining confidentiality and using a preformed structured questionnaires which assessed the patterns of cardiac symptoms, its perception and patient's knowledge of risk factors forCAD.[5]

Clinical Definitions: ST-segment Elevation Myocardial Infarction (STEMI) is defined according to the standard guideline as "a clinical syndrome defined by characteristic symptoms of myocardial ischemia in association with persistent electrocardiographic (ECG) ST elevation and subsequent release of biomarkers of myocardial necrosis".[6]

Acute STEMI is defined as STEMI within 7 days of symptom onset.

Decision delay is defined as the time interval between the onset of AMI symptoms and the action taken by the patient for medical assistance.

Prehospital delay is defined as the time interval between the onset of AMI symptoms and the arrival at the hospital.

The classic manifestation of typical ischemic chest pain is usually described as a heavy chest pressure or squeezing, a "burning" feeling, or difficulty in breathing. The discomfort or pain often radiates to the left shoulder, neck, or arm.[7] Atypical symptom is defined as the symptom other than above criteria.

Hypertension (HTN) is defined as a previously diagnosed case of HTN or chronic use of antihypertensive drugs.[8]

Diabetes Mellitus (DM) is defined as a patient previously diagnosed as DM or on oral hypoglycemic drugs or Insulin.[9]

Family History of CAD is defined as the history of premature coronary artery disease (< 55 years in first-degree male relatives and < 65 years in female relatives).

Body Mass Index (BMI) is defined as per World Health Organization (WHO) expert consultation for Asian people.[10] Overweight is defined as BMI between 23 to 24.9 and obesity as BMI >25 as per the Western Pacific Regional Office of WHO (WPRO) definition for Asian people.[11]

Smoking is defined as per the national health interview survey by the Centre for Disease Control(CDC) and prevention.[12] It defines current smoker as "an adult who has smoked 100 cigarettes in his or her lifetime and who currently smokes cigarettes."; former smoker as "an adult who has smoked at least 100 cigarettes in his or her lifetime but who had quit smoking at the time of interview." ; and never smoker as "an adult who has never smoked, or who has smoked less than 100 cigarettes in his or her lifetime." Patients were categorized as a non-smoker if they had never smoked, and those who had smoked were categorized as smokers.

Socioeconomic status is defined as per modification of Kuppuswamy's Socioeconomic Status Scale in the Context of Nepal, 2019.[13]

Study population was categorized into three groups of less than 18-44 years, 45-64 years and more than 65 years according to the Centers for Disease Control and Prevention (CDC).[14]

All data were entered into an electronic spreadsheet (Microsoft Excel, Redmond), and the statistical analysis was performed using the SPSS version 20 (IBM Armonk, NY, USA). Categorical data were expressed as frequency and percentages. Continuous data were expressed as mean ± standard deviation, while skewed data were expressed as the median and interquartile range (IQR). Results were analyzed using the chi-square test to compare the categorical variables. The logistic regressions model was used to calculate the unadjusted odds ratio, and adjusted odds ratio. The odds ratio was calculated with a predetermined level of significance (0.05) and confidence interval (CI) of 95%.

RESULTS

In our study, the mean age of the study population was 59.05±12.5 years (minimum 29 years to maximum 94 years) with male predominance 244 (71.8%). Young myocardial infarction, defined as age less than 45 years, was noted in 40 (11.8%), while 118 (34.7%) of the study population were elderly (age more than 65 years). Most of the study population belonged to the upper-lower socioeconomic status 172 (50.6%). During admission to the hospital, smoking was present in 176 (51.8%), hypertension in 161 (47.4%), obesity in 105 (30.9%), type 2 diabetes mellitus in 81 (23.8%), family history of CAD in 24 (7.1%), and history of CAD in 3 (0.9%). Health insurance coverage was received by only 38 (11.2%) of the patients. Most of the patients used an ambulance 197 (57.9%) as a mode of transport to the emergency department, followed by a taxi 57 (16.8%) (Table 1).

Table 1. Baseline characteristics of the study population.

Characteristics	Number (%)
Age in years (mean ± SD)	59.05 ± 12.5
Age Group	
18-44 years	40 (11.8)
45-64 years	182 (53.5)
>65 years	118 (34.7)
Gender	
Male	244(71.8)
Female	96 (28.2)
Socioeconomic status	
Upper class	5 (1.5)
Upper Middle class	23 (6.7)
Lower middle class	102 (30)
Upper Lower class	172 (50.6)
Lower class	38 (11.2)
CAD Risk Factors	
Smoking	176 (51.8)
Hypertension	161 (47.4)
Diabetes Mellitus	81 (23.8)
Family history of CAD	24 (7.1)
Past history of CAD	3 (0.9)
BMI	
<18.5	11 (3.2)
18.5-22.9	141 (41.5)
23-27.49	147 (43.2)
>27.5	41 (12.1)
Obesity >25	105 (30.9)
Health Insurance Coverage	38 (11.2)
Mode of transport	
Ambulance	197 (57.9)
Taxi	57 (16.8)
Private Vehicle	49 (14.4)
Public Transport	36 (10.6)
Walking	1 (0.3)

Regarding the knowledge of the CAD risk factors among the study population, 184(54.1%) of the study population thought that the history of CAD was a CAD risk factor and 137(40.3%), 132(38.8%), 110(32.4%), 105(30.9%) and 71(20.9%) considered hypertension, smoking, age, obesity, and diabetes mellitus as a CAD risk factor respectively as shown in Figure 1.

Among the total STEMI patients in our study, 259(76.2%) did not think of cardiac disease as a cause of the symptoms, whereas only 81 (23.8%) thought the symptoms were of cardiac origin. Patients belonging to the upper middle socioeconomic class were 4.76 times more likely to attriubute these symptoms to cardiac origin compared to lower socioeconomic class patients. The rest of the demographic characteristics and CAD risk factors were not significantly associated, as shown in Table 2. All three patients who had a prior history of CAD perceived chest pain to be of cardiac origin.

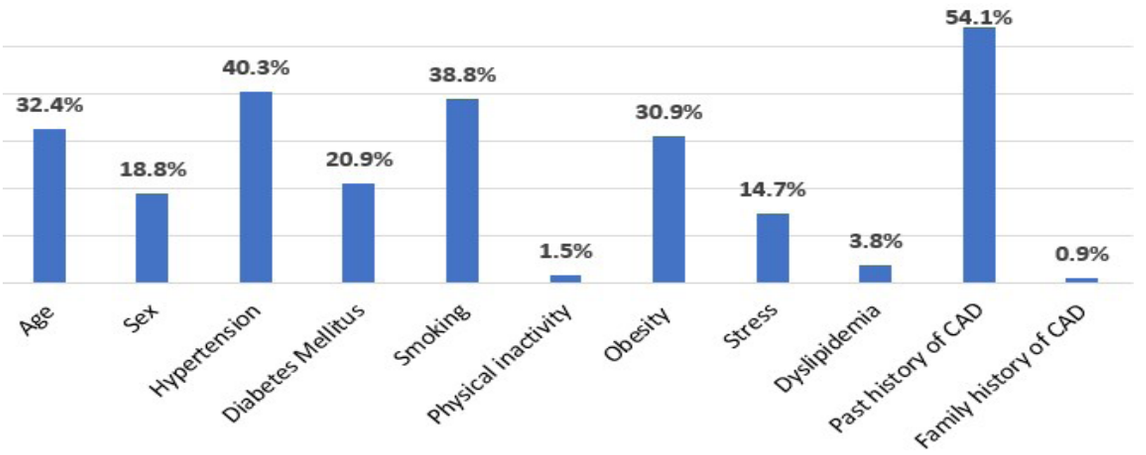

Figure 1. Awareness of CAD risk factors among the study population in percentage (n=340).

Table 2. Predictors of correct identification of perceived pain as of cardiac origin.

Characteristics	Unadjusted OR(CI)	p-value	Adjusted OR (CI)	p-value
Age				
18-44	1.49 (0.65-3.39)	0.701	1.24 (0.59-2.62)	0.562
45-64	1.32 (0.76-2.32)	0.585	1.18 (0.72-1.96)	0.500
>65	1			
Gender				
Female	1			
Male	1.51 (0.84-2.71)	0.168	0.74 (0.39-1.39)	0.354
CAD Risk Factors				
Hypertension	1.65 (0.99-2.72)	0.051	0.59 (0.35-1.01)	0.054
Diabetes Mellitus	0.81 (0.44-1.48)	0.492	1.30 (0.69-2.45)	0.406
Smoking	0.88 (0.54-1.45)	0.623	1.07 (0.64-1.80)	0.788
Obesity	1.79 (1.06-3.0)	0.028	0.65 (0.37-1.13)	0.134
Family history of CAD	1.35 (0.54-3.37)	0.524	0.82 (0.31-2.15)	0.694
Socioeconomic Status				
Upper	8 (1.09-58.55)	0.090	4.94 (0.81-30.11)	0.083
Upper middle	6.93 (2.09-23.02)	0.000	4.76 (2.00-11.32)	0.000
Lower middle	1.38 (0.51-3.74)	0.437	0.76 (0.43-1.35)	0.360
Upper lower	1.51 (0.59-3.89)	0.528	0.82 (0.50-1.36)	0.824
Lower	1			

While analyzing the pattern of cardiac symptoms, typical chest pain was present in 299 (87.9%) of the patients. Sweating was present in 229 (67.4%) of the patients and shortness of breath in 184(54.1%), followed by vomiting 72(21.2%), nausea 57(16.8%), dizziness 56(16.5%), and syncope 37(10.9%). On evaluating the predictors of typical chest pain in our study population, there was no significant difference in perception of typical chest pain among baseline demographic characteristics and CAD risk factors (Table 3). All three patients with a prior history of CAD perceived chest pain as typical chest pain.

The typical chest pain was not significantly associated with the perception of the symptoms as a cardiac origin with OR 1.33 (CI 0.59-3.01, p-value 0.490) and adjusted OR of 1.29 (CI 0.56-2.97, p-value 0.548).

The median decision delay was around 15 minutes with the interquartile range of 10 minutes to 15 minutes and the range of 1 minutes to 7 days. The median prehospital delay was 30 minutes with the interquartile range of 20 minutes to 45 minutes and the range of 5 minutes to 7 days. Most of the patients, 311(91.5%) presented to the nearby health care center less than 12 hours after the onset of cardiac symptoms, whereas only 29 (8.5%) presented more than 12 hours later after the symptom onset.

When assessing the predictors of the arrival of STEMI patients to the nearby health care center within the recommended reperfusion period of 12 hours, none of the baseline demographic variables and CAD risk factors was statistically significant (Table 4). All three patients who had a prior history of CAD presented to the emergency within the recommended reperfusion period of 12 hours.

Perception of symptoms as a cardiac origin was also not statistically associated with a presentation to the nearby health care center within 12 hours of symptom onset with the OR 0.56 (CI 0.25-1.26, p-value 0.159) and adjusted OR of 0.54 (CI 0.23-1.26, p-value 0.159. Also, the presence of typical chest pain was not statistically significant with OR 0.52(CI 0.12-2.26, p-value 0.372) and adjusted OR of 0.50 (CI 0.11-2.26, p-value 0.373).

Table 3. Predictors of typical chest pain among patients presented with STEMI.

Characteristics	Unadjusted OR (CI)	p- value	Adjusted OR (CI)	p-value
Age				
18-44	1.02 (0.35-3.01)	1.00	1.04 (0.38-2.84)	0.927
45-64	1.12 (0.55-2.26)	0.88	0.90 (0.46-1.73)	0.752
>65	1			
Gender				
Female	1			
Male	0.58 (0.26-1.31)	0.186	2.0 (0.83-5.0)	0.120
CAD Risk Factors				
Hypertension	1.17 (0.61-2.26)	0.637	0.90 (0.45-1.80)	0.778
Diabetes Mellitus	0.97 (0.45-2.07)	0.928	1.08 (0.49-2.38)	0.842
Smoking	0.73 (0.38-1.42)	0.355	1.34 (0.68-2.63)	0.391
Obesity	1.44 (0.68-3.07)	0.337	0.81 (0.36-1.79)	0.605
Family history of CAD	3.33 (0.44-25.37)	0.218	0.29 (0.03-2.28)	0.240

Table 4. Predictors of presentation to the emergency less than 12 hours.

Variable	OR (CI)	p-value	Adjusted OR (CI)	p-value
Age				
18-44	0.9 (0.23-3.56)	1.0	1.17 (0.33-4.05)	0.804
45-64	0.66 (0.28-1.58)	0.442	0.68 (0.31-1.49)	0.337
>65	1			

Gender				
Female	1			
Male	1.15(0.51-2.64)	0.726	0.77(0.31-1.93)	0.585
CAD Risk Factors				
Hypertension	1.3(0.6-2.82)	0.051	0.85(0.37-1.92)	0.704
Diabetes Mellitus	2.06(0.69-6.1)	0.185	0.53(0.17-1.63)	0.270
Smoking	0.63(0.29-1.38)	0.246	1.57(0.70-3.53)	0.266
Obesity	1.19(0.51-2.79)	0.688	0.79(0.31-1.95)	0.611
Family history of CAD	2.24(0.29-17.19)	0.707	0.47(0.05-3.80)	0.481
Socioeconomic Status				
Upper middle	0.57(0.11-3.1)	0.431	0.59 (0.16-2.13)	0.427
Lower middle	1.37(0.33-5.78)	0.351	1.71 (0.67-4.33)	0.257
Upper lower	0.78(0.22-2.81)	0.477	0.70 (0.32-1.51)	0.368
Lower	1			

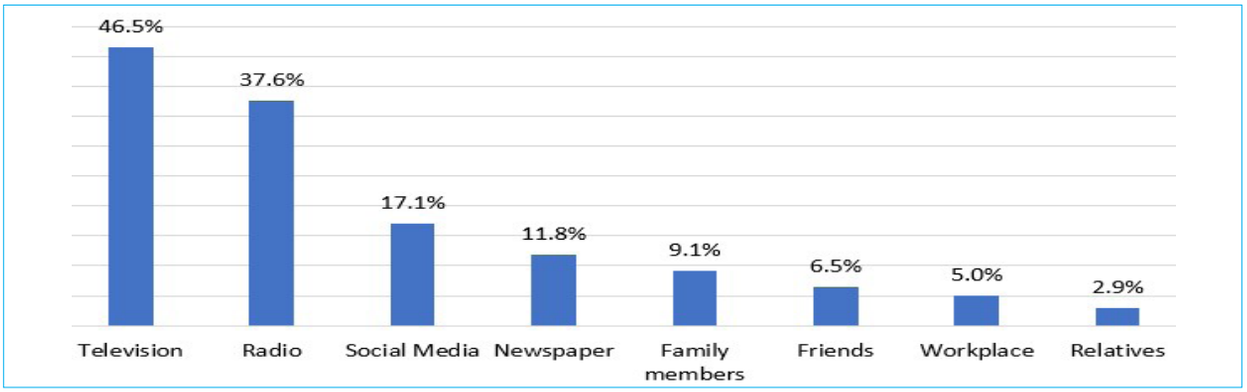

Figure 2. Source of information regarding CAD and its risk factors.

When inquired about the different sources of information regarding cardiovascular diseases and their risk factors, 158(46.5%) of the patients mentioned television as a source of information. Other sources included radio 128(37.6%), social media 58(17.1%), newspaper 40(11.8%), and family members 31(9.1%) as a source of information in the decreasing order (Figure 2).

DISCUSSION

In our study, only 23.8% of the patients thought of the symptom as a cardiac origin, similar to a study conducted in Portugal[15] where 25% of the study participants perceived the same. However, it was much less compared to studies conducted in community settings regarding MI symptom knowledge in Ireland (67.5%)[16] and the United States (56.6%).[2] The difference in the perception might be increased knowledge of CAD risk factors and awareness of ischemic symptoms in the latter group of patients. Efforts to reduce delays in seeking medical care among persons with STEMI symptoms should address these deficiencies in knowledge. There was increase in perception of symptoms as cardiac origin in upper middle socioeconomic class compared to the patients belonging to lower socioeconomic class as the knowledge of symptoms of cardiac disease might have increased the perception pattern.

In our study, 12.1% of the patients had atypical symptoms. The incidence of atypical symptoms ranged from 8.4% in the GRACE study to 35.5% in the National Registry of Myocardial Infarction (NRMI) study.[17-19] These patients are frequently misdiagnosed and undertreated with adverse outcomes, as noted in the GRACE study with higher in-hospital mortality than typical symptoms (13.0% vs. 4.3%). In the NRMI study, in-hospital mortality was 20.0% in patients with atypical symptoms and 7.2% in those with typical symptoms. A similar study done

in Korea and Japan reported that STEMI patients with atypical symptoms tended to be managed without primary PCI and longer door-to-balloon time.[20,21] A significant number of patients delay seeking medical care is due to the inability to recognize typical symptoms and signs of myocardial infarction.

The median prehospital delay was 30 minutes, and the median decision delay was 15 minutes in our study, with 91.5% of the patients presented to the nearby health care center within the recommended time of less than 12 hours for the reperfusion therapy of STEMI. The median was used in this study as the range of the prehospital delay and decision delay was very wide with high standard deviation around the mean. A study done in the United Kingdom showed South Asian patients with AMI symptoms reported to have a longer delay.[22] Variety factors, including sociodemographic, behavioral, clinical, and contextual characteristics, are responsible for such delay. Older age, lower- income, and history of diabetes were also identified as causing the long delay; however, the results of the studies are inconsistent.[23] Other possible reasons for the delay are denial, self-treatment, fear, concern about costs, and embarrassment. Our study also did not demonstrate any significant association with any demographic variables in regards to delay in the presentation to the nearby health care center. Three patients who had a history of CAD all presented within 12 hours of symptom onset. The experience and interpretation of symptoms may be important factors for arrival to the hospital during STEMI.[24] However, mass media campaigns aimed at increasing public knowledge to promote early presentation to the hospital during STEMI have been shown with little or no difference in delay.[25,26]

Our study has found no influence of age or gender on STEMI perception similar to other studies.[3,27,28] However, some authors reported a positive relationship between older age and greater delays in seeking acute medical care.[29,30] Prior studies on delay times between women and men are conflicting. The majority of the patients that presented to our hospital belonged to the lower-middle-class and upper-middle-class socioeconomic status. These may reflect the financial condition of most of the patients that presented to our center. However, only 11.2% were covered by health insurance coverage. It demonstrates the need to increase the insurance coverage to most of the population in our country with effective lucrative and increased awareness of the benefits of the insurance schemes. Also, the majority of the patients used an ambulance for transportation to the nearby health care center. It is important to upgrade the availability and services of the ambulance for better and early transportation across the health facilities resulting in prompt STEMI management and care. Also, in our study, most of the information regarding CAD was acquired from television, radio, and social media. This reflects the use of proper mediums for awareness programs targeting the appropriate audience for the CAD risk factors, and STEMI knowledge could be beneficial. It is also important to design interventions that can be delivered to the socioeconomically disadvantaged, racial and ethnic minorities, and high-risk groups with a message describing the complex constellation of heart attack symptoms. The use of role model stories may be effective in these educational efforts. An educational program in the community setting, focusing on symptom awareness and recognition of STEMI symptoms, may help to improve illness perception. However, educational programs that aim to increase awareness of chest pain in the community may have unclear benefits, with increased anxiety about noncardiac symptoms leading to increased health care utilization for non-cardiac chest pain.

The knowledge regarding different CAD risk factors in our study was less than 50% on average. A qualitative study suggested that patients who sought help early knew a wider range of heart attack symptoms.[31] The VIRGO study also demonstrated that only one-half of young AMI patients believed they were at risk for heart disease before their AMI hospitalization and even fewer discussed their risks or risk modification with their health care providers.[32] Therefore, it is important that patients are aware of their risk factors and are educated about their risk. They should be considered as having a greater need to know and should be educated about heart attack symptoms with more personalized programs. Although numerous guidelines emphasize the importance of risk assessment and patient education for improving the quality of preventive care, the presence of coronary heart disease risk factors was not consistently associated with knowledge suggesting poor effective management regarding education about MI symptoms.[2] These patients provide the wider opportunity for education by health care professionals to minimize the prehospital delay during STEMI as the knowledge of risk factors status might be associated with knowledge of symptoms. All the patients who had a history of CAD presented to the nearby health center within the 12 hours of symptom onset in our study suggesting greater knowledge of heart attack symptoms.

There are few limitations to our study. The data on STEMI symptoms were elicited retrospectively while the patients were recovering in the hospital, leading to a possibility of recall bias and inaccuracy. However,

in order to minimize the recall bias, the interview was conducted within 2-3 days of admission. Also, the risk factors like physical inactivity, diet, and dyslipidemia with measurement of lipid profile were not assessed. A cohort study design with proper follow-up and in-hospital outcomes would provide a more detailed picture. This is a single center hospital-based data; however, this center is a tertiary cardiac referral center where all the patients from different parts of the country are referred; hence these results might represent our population. The time taken for referred patients to arrive at our center from the nearby health care center and the severity of the symptoms were not evaluated in this study. Further study with the inclusion of these parameters as the study objective might clarify the scenario.

CONCLUSIONS

Most STEMI patients presented with typical chest pain; however, identification of the chest pain as a cardiac origin was low. Also, the awareness of the CAD risk factors was low among STEMI patients in our study. We should focus on identifying factors causing delay and potential barriers like the cost and availability of health care utilization to understand better proper interventions for the specific population that are more likely to succeed. In addition, properly targeted awareness programs using appropriate mode for patients with CAD risk factors will result in early presentation and management. Thus, multicultural efforts to educate, reassure, and motivate at-risk patients and their families are needed to improve STEMI care in Nepal.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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