Background and Aims: Incidence of ST-elevation myocardial infarction (STEMI) is increasing in Nepal. We aim to describe the presentation, management, complications and outcomes of patients admitted with a diagnosis of STEMI in Shahid Gangalal National Heart Centre (SGNHC), Nepal.

Methods: Shahid Gangalal National Heart Centre-ST-elevation registry (SGNHC-STEMI) registry was a cross sectional, observational, registry. All the patients who were admitted with the diagnosis of STEMI from January 2018 to December 2018 were included.

Results: In this registry, 1460 patients out of 1486 patients who attended SGNHC emergency were included. The mean age of patients was 60.8±13.4 years (range: 20 years to 98 years) with 70.3% male patients. Most of the patients (83.2%) were referred from other hospitals and 16.8% of patients directly attended the SGNHC emergency. During the presentation, smoking (54%) was the most common risk factor, followed by hypertension (36.6%), diabetes mellitus (25.3%), and dyslipidemia (7.8%). After admission, new cases of dyslipidemia, HTN, Impaired Fasting Glucose (IFG), and Type 2 DM were diagnosed in 682 (51.3%), 182 (20.1%), 148 (10.3%) and 95 (8.9%) respectively. At the time of presentation, 73.3% were in Killip class I and 26.3% were above Killip class II with 5.1% in cardiogenic shock. Thirty-one percent of the cases received reperfusion therapy (Primary percutaneous intervention in 25.2% and fibrinolysis in 5.8%). Inferior wall MI was the most common type of STEMI. Among the patients who underwent invasive intervention, multi-vessel disease was noted in 46.2% cases and left main coronary artery involvement in 0.7% cases. In-hospital mortality was 6.2% with cardiogenic shock being the most common cause. Aspirin (97.8%), clopidogrel (96.2%), statin (96.4%), ACEI/ARB (76.8%) and beta-blocker (76.8%) were prescribed during discharge.

Conclusion: The SGNHC-STEMI registry provides valuable information on the overall aspect of STEMI in Nepal. In general, the SGNHC-STEMI registry findings are consistent with other international data.

Keywords: Nepal; Primary PCI; STEMI Registry; Thrombolysis.
be a marked increase in the burden of coronary artery disease (CAD) in developing countries, which is primarily due to the social and economic changes that have occurred with urbanization and industrialization, leading to a higher prevalence of cardiovascular risk factors.²

The South Asian countries; India, Pakistan, Bangladesh, Sri Lanka, and Nepal account for almost a quarter of the world’s population and contribute the highest proportion of the burden of cardiovascular diseases as compared with any other region globally.³ Moreover, there is poor access to evidence-based medical therapies and interventions for the great majority of patients. Therefore, outcomes in terms of both morbidity and mortality are often poor for the patients in this region. It has been noted that patients in South Asia are often affected with CAD at a relatively young age, thus impacting the working-age population more severely with major socioeconomic impacts for families who lose wage earners. In addition, this also causes a loss in national productivity and adversely affects national development.⁴ Among the different forms of CAD, ST elevation myocardial infarction (STEMI) has the highest in-hospital mortality.⁵

The true incidence of STEMI in Nepal is still unknown. Based on the Shahid Gangalal National Heart Centre (SGNHC) annual reports, there has been a significant increase in STEMI patients in recent years. In a retrospective study done at the SGNHC from 2001 to 2012, 4599 patients were admitted for STEMI that accounted for 62% of the acute coronary syndrome (ACS) patients. Of those admitted with STEMI, only 27.5% received reperfusion therapy.⁶ Failure to reach the hospital within 12 hours after the onset of symptoms was recognized as the primary reason for not instituting the reperfusion therapy in STEMI. Multiple studies in SGNHC and other institutions of Nepal to study the risk factors, treatment, and outcomes of STEMI were conducted, but most of them were retrospective in nature with small sample size.⁷,⁸,⁹,¹⁰,¹¹,¹²,¹³ In this registry, we aim to study the overall aspects of STEMI patients in the SGNHC, the tertiary cardiac national heart center of Nepal.

Methods

Shahid Gangalal National Heart Centre-ST-elevation registry (SGNHC-STEMI registry) was a cross-sectional, observational, registry conducted at SGNHC, Bansbari, Kathmandu, Nepal. All the patients who presented to SGNHC emergency (ER) from January 2018 to December 2018 in the national heart center with the diagnosis of acute STEMI (within seven days after the onset of symptoms) were included. A Performa was designed to collect information about the risk factors, mode of arrival, treatment received, and complications during admission. Data was collected through face-to-face interviews and hospital records. Patients with incomplete data and “left against medical advice” were excluded. Age, gender, conventional risk factors (tobacco, family history of coronary artery disease, history of diabetes, hypertension, and dyslipidemia), type of MI (anterior, extensive anterior, anteroseptal, inferior, lateral, posterior, inferior with right ventricular infarction), symptoms, the time interval from symptom onset to hospital arrival and vitals at presentation were recorded. In addition, in-hospital treatment including reperfusion strategies (thrombolysis, primary percutaneous coronary intervention (PCI), delayed PCI, conservative management, coronary artery bypass grafting), outcome, complications, and medications during discharge was recorded. Patients were followed through the phone to assess the one-month follow up outcome. The operational definitions of STEMI, risk factors, the definition of coronary artery disease (CAD), and complications are shown in table 1 to 4.

Data were analyzed using the statistical software, SPSS version 20. Ethical approval for this study was taken from the Institutional Review Committee of SGNHC. Informed written consent after proper counseling regarding the nature and purpose of the study was taken from each respondent.

Table 1: STEMI definition according to ECG findings

| Type of Myocardial infarction | ECG findings |
|------------------------------|--------------|
| Extensive anterior wall       | ST elevation in leads V1-V6, I and aVL. |
| Anteroseptal wall             | ST elevation in V1 to V4          |
| Anterior wall MI              | ST elevation in leads V1 to V6    |
| Inferior wall MI              | ST elevation in leads II, III and aVF |
| Inferior wall MI with RV ischemia | ST elevation in leads II, III and aVF with ST elevation in V4R |
| Lateral wall MI               | ST elevation in leads V5, V6, L and aVL |
| High lateral wall MI          | ST elevation in Lead I and aVL    |
| Inferior posterior wall MI    | ST elevation in II, III, aVF and tall R wave in V2, V3 and ST depression in V2,V3 |

Table 2: Definition of risk factors

1. Hypertension
   - Diagnosed case on lifestyle modification or medication OR
   - Blood pressure ≥140/90 mmHg two episodes during the admission

2. Diabetes
   - Diagnosed case on lifestyle modification or medication OR
   - Fasting glucose ≥ 7.1mmol/L

3. Dyslipidemia
   - Diagnosed case on lifestyle modification or medication OR
   - If meets any of the following criteria:
     a. Total cholesterol (TC) greater than 5.18 mmol/L; or
     b. Low-density lipoprotein (LDL) greater than or equal to 3.37 mmol/L; or
     c. High-density lipoprotein (HDL) less than 1.04mmol/L.

4. Family history of premature Coronary artery disease
   - 1st degree relatives had CAD before 55 years in males and before 65 in females.

5. Smoking status
   a. Never smoked
      - Adults who have never smoked or who smoked fewer than 100 cigarettes in their entire lifetime
b. Current smoker
Adults who have smoked at least 100 cigarettes in their lifetime and currently smoke cigarettes every day (daily) or some days (non-daily) OR quit smoking within last year.

b. Ex-smoker
Adults who have smoked at least 100 cigarettes in their lifetime but say they currently do not smoke AND quit smoking more than one year ago.

d. Uses non-smoking tobacco
Examples include snuff, chewing tobacco, tobacco added in paan etc.

Table 3: Definition of diseases in coronary angiogram

| Disease Type            | Definition                                      |
|-------------------------|-------------------------------------------------|
| Single vessel disease   | More than 50% stenosis in one epicardial vessel |
| Double Vessel disease   | More than 50% stenosis in two epicardial vessels|
| Triple vessel disease   | More than 50% stenosis in three epicardial vessels|
| Left main disease       | More than 50% stenosis in Left main              |
| Non critical coronaries | Less than 50% Stenosis in any of epicardial vessel|

Table 4: Definition of different complications

| Complication                  | Definition                                                                 |
|-------------------------------|-----------------------------------------------------------------------------|
| Major bleeding                | • Requiring a transfusion of >2 U PRBCs or,                                 |
|                               | • Resulting in a decrease in hematocrit of >10% or,                         |
|                               | • Occurring intracerebrally or,                                             |
|                               | • Resulting in stroke or death                                              |
| Cerebrovascular complications | • TIA (Transient ischemic attack): Focal neurologic deficit lasting less than 24 hours without brain imaging suggestive of a primary ischemic origin leading to tissue infarction. |
|                               | • Ischemic stroke: Stroke is defined as any focal neurologic deficit lasting > 24 hours with or without brain imaging suggestive of a primary ischemic origin leading to tissue infarction. |
|                               | • Intracranial hemorrhage: Brain imaging suggestive of Intracranial hemorrhage. |
| Cardiac rupture               | As diagnosed by echocardiography                                             |
| Stent thrombosis             | Proven with the angiogram presence of the occluded vessel in the stented vessel. |

Results
During the study period, 1486 patients presented to emergency with the diagnosis of STEMI. However, five patients left the hospital against medical advice, and detailed information was missing in 21 patients, so they were excluded. Among the 1460 patients included in the study, 1027 (70.3%) were male and 433 (29.7%) were female. Age ranged from 20 years to 98 years with a mean of 60.8±13.4 years. Most of the patients were of the age group 55-74 years as shown in Table 5.

Table 5: Distribution of patients based upon age groups. n=1460

| Age group | Number | %  |
|-----------|--------|----|
| <35       | 32     | 2.2|
| 35-44     | 141    | 9.6|
| 45-54     | 274    | 18.8|
| 55-64     | 385    | 26.4|
| 65-74     | 399    | 27.3|
| >75       | 229    | 15.7|

Among the 1214 referred patients, an ambulance was the preferred mode of transportation followed by taxi as shown in Table 6.

Table 6: Mode of transport among referred patients n=1214

| Mode of transport | Number | %  |
|-------------------|--------|----|
| Ambulance         | 789    | 64.9|
| Taxi              | 207    | 17.1|
| Others            | 156    | 12.8|
| Motorcycle        | 36     | 2.9 |
| Helicopter        | 14     | 1.1 |
| Plane             | 12     | 0.9 |

Among the 246 patients who directly attended the SGNHC ER, the taxi was the preferred mode of transport followed by ambulance as shown in Table 7.

Table 7: Mode of transport among patients who attended SGNHC directly (n=246)

| Mode of transport | Number | %  |
|-------------------|--------|----|
| Taxi              | 90     | 36.5|
| Motorcycle        | 55     | 22.4|
| Ambulance         | 74     | 30.1|
| Helicopter        | 6      | 2.4 |
| Others            | 21     | 8.6 |
Risk factors and Past medical illness

| Condition                           | Number | Percentage |
|-------------------------------------|--------|------------|
| Myocardial Infarction (STEMI)       | 42     | 2.9        |
| Unstable Angina                     | 20     | 1.4        |
| NSTEMI                              | 16     | 1.1        |
| CKD                                 | 7      | 0.5        |
| CVA                                 | 17     | 1.2        |
| Cancer                              | 3      | 0.2        |
| Dialysis                            | 2      | 0.1        |
| Family history of premature CAD     | 22     | 1.5        |
| Hypertension                        | 535    | 36.6       |
| DM                                  | 370    | 25.3       |
| Dyslipidemia                        | 114    | 7.8        |
| Current smoker                      | 573    | 39.2       |
| Chewing Tobacco                     | 33     | 2.2        |
| Ex-smoker                           | 217    | 14.8       |
| Non-smoker                          | 637    | 43.6       |

Table 8: Risk factors and past medical history (n=1460)

Killip Class

At the time of presentation, 73.3% were in Killip class I and 26.3% were above Killip class II with 5.1% in cardiogenic shock as shown in table 10.

Blood parameters with their range, mean and SD are shown in Table 11. Among the 1444 patients, total cholesterol >5.18 mmol/L in 146 (10.1%), HDL<1.04 mmol/L in 509(35.2%), LDL >3.37 mmol/L in 93 (6.4%), Creatinine >200μmol/L in 23 (1.6%) patients.

Table 11: Blood test after admission among those who survived more than 24 hours in hospital (n=1444)

| Laboratory investigations |
|---------------------------|
| Blood parameters          |
| Mean±SD                   |
| Range                     |
| Total Cholesterol (TC)    | 4.0±1.2 mmol/L | 2-15.3 mmol/L |
| Triglyceride (TG)         | 1.6±0.9 mmol/L | 0.3-13.2 mmol/L |
| High-density lipoprotein (HDL) | 1.0±0.1 mmol/L | 0.7-1.9 mmol/L |
| Low-density lipoprotein (LDL) | 2.1±0.8 mmol/L | 0.7-6.4 mmol/L |
| Hemoglobin (Hb)           | 13.2±2.1 gm/dl | 4-23.2 gm/dl |
| Serum creatinine (Cr)     | 84.4±4.84 umol/L | 29-787 µmol/L |
| Random blood glucose (RBS) | 7.2±5.4 mmol/L | 3.4-28.8 mmol/L |
Reperfusion therapy at SGNHC

Among the 1460 patients admitted in SGNHC during the study period, 86 (5.8%) patients underwent thrombolysis (78 Streptokinase and 8 Tenecteplase) out of which, 9 (10.4%) patients died. Patients who underwent cardiac catheterization were 392 (26.8%) among which PPCI with stenting was performed in 344 (87%) cases, plain old balloon angioplasty (POBA) was performed in 13 (3.3%) cases and non-critical stenosis was diagnosed in 12 (3%) patients. The radial artery (73%) was the most common route for intervention. Thrombosuction only was done in 10 cases whereas thrombosuction followed by stenting was done in 5 cases. There were 9 (2.2%) deaths in the catheterization laboratory (Cath Lab). Drug-Eluting Stents (DES) was used in 85.5% and Bare Metal Stents (BMS) in 14.5% who underwent PPCI. Early stent thrombosis was encountered in 3 (0.8%) cases. LAD was the most common culprit vessel followed by RCA as shown in Table 12.

Table 12: Culprit vessel among PPCI patients (n=367)

| Vessel  | Number | %  |
|---------|--------|----|
| LAD     | 179    | 48.8|
| RCA     | 150    | 40.9|
| LCX     | 28     | 7.7 |
| Ramus   | 2      | 0.5 |
| Left main | 3   | 0.8 |
| OM      | 2      | 0.5 |
| Diagonal| 3      | 0.8 |

Reperfusion therapy in the referring hospitals

Among 1214 patients referred from other hospitals, 65 (5.3%) patients received thrombolysis (Streptokinase in 51 (4.2%), and Tenecteplase in 14 (1.1%)) and Primary PCI (PPCI) in 33 (2.7%) patients in the referring hospital. Aspirin, clopidogrel, and statin were prescribed in 1009 (83.1%), 962 (79.2%), and 901 (74.2%) patients respectively.

Table 13: Interventions and procedure during hospital stay (n=1460)

| Interventions/Procedures | Number | %  |
|--------------------------|--------|----|
| PCI                      | 208    | 14.2|
| Temporary pacemaker insertion (TPI) | 65 | 4.4 |
| CABG                     | 45     | 3.1 |
| Rescue PCI               | 25     | 1.7 |
| Intraaortic balloon pump (IABP) | 1 | 0.06|
| Endotracheal Intubation  | 51     | 3.4 |

Complications during hospital stay

Ventricular arrhythmias (8.1%) followed by heart failure (7.4%) were the most common complication during the hospital stay as shown in Table 15. In-hospital mortality was 6.2%, which is described later.

Table 14: Coronary Angiogram results (n=1199)

| Findings       | Number | %  |
|----------------|--------|----|
| SVD            | 606    | 50.5|
| DVD            | 344    | 28.7|
| TVD            | 210    | 17.5|
| Non-critical   | 31     | 2.6 |
| LM disease     | 8      | 0.7 |

Table 15: Complications during the hospital stay (n=1460)

| Complication                                      | Number | %  |
|---------------------------------------------------|--------|----|
| Heart failure                                     | 108    | 7.4 |
| Left ventricle (LV) Clot                          | 31     | 2.1 |
| Cardiac rupture                                   | 19     | 1.3 |
| Ventricular septal rupture (VSR)                   | 4      | 0.2 |
| Ischemic stroke                                   | 5      | 0.3 |
| Hemorrhagic stroke                                | 2      | 0.1 |
| Major bleeding                                    | 4      | 0.2 |
| TIA (Transient Ischemic Attack)                   | 3      | 0.2 |
| In-hospital mortality                             | 91     | 6.2 |
| Death within 24 hour                              | 16     | 1.1 |
| Ventricular arrhythmias (Including ventricular tachycardia and ventricular fibrillation) | 118 | 8.1 |
| Supraventricular arrhythmias including atrial fibrillation | 33   | 2.3 |

Shahid Gangalal National Heart Centre-ST-elevation Myocardial infarction Registry (SGNHC-STEMI- Registry), Nepal.
Echocardiographic findings at the time of Discharge

The mean left ventricular ejection fraction left ventricular internal dimension (LVID) was 43.3±10.1%. LVEF<40% was present in 570 (41.7%) patients. Among the 1369 discharged patients, LVID diastole ranged from 3 to 7.7 cm (mean 4.8±0.5), LVID systole ranged from 2.1 to 6.6 cm (mean 3.4±0.6). Severe mitral regurgitation (MR) was present in 30 (2.2%) among discharged patients, whereas Moderate MR was present in 149 (10.8%) patients.

Treatment during discharge

Among the 1369 patients discharged from hospital aspirin, clopidogrel, statin, ACEI/ARB, and beta-blockers were prescribed in 97.8%, 96.2%, 96.4%, 76.8%, and 74.4% patients respectively as shown in table 16. Pneumococcal and Influenza vaccination was done in 89 (6.5%) and 86 (6.2%) patients respectively. Counseling about the disease, its risk factors, and lifestyle modification/prevention was done in 1356 (99.1%) patients.

Table 16: Medication at the time of discharge (n=1369)

| Medication         | Number | %     |
|--------------------|--------|-------|
| Aspirin            | 1338   | 97.8  |
| Clopidogrel        | 1316   | 96.2  |
| Aspirin            | 1338   | 97.8  |
| Clopidogrel        | 1316   | 96.2  |
| Atorvastatin       | 687    | 50.2  |
| Rosuvastatin       | 632    | 46.2  |
| Enalapril          | 772    | 56.4  |
| Ramipril           | 116    | 8.5   |
| Losartan           | 154    | 11.3  |
| Telmisartan        | 8      | 0.6   |
| Bisoprolol         | 30     | 2.2   |
| Carvedilol         | 32     | 2.4   |
| Metoprolol tartrate| 461    | 33.7  |
| Nebivolol          | 5      | 0.4   |
| Metoprolol Succinate| 491   | 35.9  |
| Nitrates           | 536    | 39.2  |
| Furosemide         | 484    | 35.4  |
| Torsemide          | 15     | 1.1   |
| Spironolactone     | 321    | 23.4  |

In-hospital mortality

Among 1460 patients, there were 91 (6.2%) in-hospital mortality, 16 (1.1%) of patients died within 24 hours of admission. Patients who underwent cardiac catheterization, 9 patients died in the cath lab and 15 patients died after PPCI during the hospital stay. In-hospital mortality among patients taken for primary PCI at SGNHC was 6.1%. In-hospital mortality among the patients who underwent thrombolysis at SGNHC was 10.4%. Cardiogenic shock was the most common cause of death as shown in table 17.

Table 17: Causes of death (n=91)

| Reason of death                  | Number | %     |
|----------------------------------|--------|-------|
| Cardiogenic shock                | 62     | 68.1  |
| Cardiac rupture                  | 19     | 20.8  |
| Ventricular septal rupture       | 4      | 4.3   |
| Ventricular tachycardia or ventricular fibrillation | 3 | 3.2 |
| Septic Shock                     | 3      | 3.2   |

One-month outcome

Thirty days follow up was done in 1075 patients among 1369 discharged patients through phone calls and the results are shown in Table 18. However, 294 (21.4%) patients could not be contacted.

Table 18: One month follow up outcome post-discharge (n=1369)

| Status      | Number | %     |
|-------------|--------|-------|
| Alive       | 982    | 91.3  |
| Dead        | 93     | 8.7   |

Discussion

SGNH-STEMI registry is the first of its kind from Nepal and provides information about the different aspects of STEMI in SGNHC, the largest tertiary cardiac care center in Nepal. It well reflects the current scenario of the presentation, management, and outcome of STEMI in Nepal.

In our study 70% of the patients are male. Similar results of male dominance in STEMI were present in studies across the globe.14,15,16,17,18,19,20 Age ranged from 20 years to 98 years with the mean of 60.8±13.4 years, which is similar to the registries from Kerala19 (60.4±12.1), Poland21 (64.0±12.4) and Taiwan22 (61.1±13.6). But it was lower in UAE-ACS registry (50.8 years),23 Kuwait (55.5 years),24 India 57 years.25 In the Global Registry of Acute Coronary Events mean age was 64 to 69 years,26,27,28 in Euro Heart Survey 1 and 2 it was 63 years.29,30 In this registry, most patients fall under the age group of 65 to 74 years. However, the number of patients between 55 to 64 years age group is almost similar. The least were of the age group less than 35 years old. STEMI patients who are less than 45 years account for 11.8%. This was slightly higher compared to previous studies that have estimated that 5-10% of myocardial infarctions (MI) occur in patients younger than 45 years old.31,32,33,34,35 Interestingly, around 30% of the total patients are of less than 55 years of age. Though the actual reason for this is not clearly understood, the change in lifestyle, urbanization, increased incidence of smokers in that age group, and change in dietary habits in Nepal can be the probable reasons. This provides a basis for consideration of acute coronary syndrome as an important cause of chest pain even

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in the young population of the country with or without conventional risk factors.

In the referred patients, ambulance (64.9%) was the preferred mode of transport followed by taxi (17.1%). Whereas, patients who directly attended the SGNHC emergency, taxi (36.5%) was the most common mode of transport followed by ambulance (30.1%). The findings are similar to the CREATE registry from India 25 and the registry from Abu Dhabi.26 The reason can be due to lack of EMS service in our country. The time of symptom onset to FMC was equal in both patients group who attend other hospitals or to the SGNHC, which suggests that they perceive the symptom in the same manner as seen in other studies.

At the time of arrival in the SGNHC emergency, 73.7% were in Killip I, 18.5% in Killip II, and 2.7% were in Killip III. A total of 5.1% of cases presented in Killip class IV. Similar findings were noted in Malaysian registry38 and ARG-EN-IAM-ST registry.17

In our study, past history of ACS was present in 5.4%, CVA in 1.2% cases, and CKD in 0.5%. Among STEMI patients in the Kerala ACS registry, the history of MI was present in 13.1% and a history of stroke in 2.2% cases.29 In a CREATE registry from India, myocardial infarction was present in 11.5% of STEMI patients.22 In Algerian Registry, CVA was present in 1.1% of cases.21 In a Latvian Registry, among STEMI patients from the year 2005 to 2010, previous MI was present in 15.8% to 23.3% whereas the previous stroke was present in 5.7% to 7.2% cases.30 In SCAR 2011 and ARG-EN-IAM-ST 2015 registry from Argentina previous MI was present in 10.9% and 9.7% cases.31

In our study, current smoking status (39.2%) was the most common risk factor followed by hypertension (36.6%), DM (25.3%), and family history of premature CAD in 1.5% at the time of admission. These conventional risk factors vary significantly in different registries around the world. In Thai Registry I and II current smokers were 42.7% and 41.8%, HTN in 51.4% and 49.8%, DM in 37.2% and 47.6%, and dyslipidemia in 72.5% and 8.9% cases.22 In the Kerala ACS registry among STEMI patients DM in 37.6%, HTN in 48.4%, and smoking in 34.4% cases.28 In Argentina CONAREC XVII Registry smoking in 66.3% cases, dyslipidemia in 51.7% cases, DM in 22.1% cases, and Hypertension in 63.8% cases.29 In Algerian Study HTN was present in 33% cases, DM 29.2% cases, dyslipidemia in 6.3% cases and tobacco in 34.1% cases.23 In Yemen, DM was present in 25.7% cases, HTN in 9.2% cases, dyslipidemia in 13.1% cases and participants being a current smoker in 49.9% cases. In Oman, DM was present in 30.6%, HTN in 22.2% cases, dyslipidemia in 10.8% cases, and current smoker in 35.7% cases. In other gulf countries which include Bahrain, Kuwait, Qatar, and the UAE, DM was present in 30.6% cases, HTN in 20.3% cases, dyslipidemia in 14.9% cases, and current smokers in 54.7% cases.32 In the SCAR registry 2011 from Argentina, 41.7% of cases were smoker, dyslipidemia was present in 50.2%, HTN in 61.8% cases, and DM in 19.5% cases. In another ARG-EN-IAM-ST registry 2015, 69% were smokers, dyslipidemia in 42.9% cases, HTN in 54.2% cases, and DM in 21% cases.33 In our study, although the previously diagnosed cases of conventional risk factors, especially dyslipidemia, diabetes, and HTN were less at presentation compared to other studies, more cases were diagnosed after admission, probably due to lack of awareness and routine health check-up.

In our study reperfusion therapy is provided to 32.7% cases. SGNHC emergency follows the international guideline and offers reperfusion therapy to all the patients who are eligible for the therapy. In the Argentine Registry, seventy-four percent of patients underwent reperfusion therapy, representing 92% of eligible patients, since 18% that did not receive emergency reperfusion had evolving myocardial infarction or with normal ST-segment after the first measures adopted. Only 8% of patients with emergency reperfusion criteria did not receive it. Among patients treated with reperfusion therapy, 80% underwent primary angioplasty and the remaining 20% received thrombolytics, mainly streptokinase (85%).22 In the CREATE registry from India 58.5% of patients were thrombolysed and 8% underwent PP-PCI.23 In the Global Registry of Acute Coronary Syndromes, PP-PCI was done in 40% cases and thrombolysis was done in 47% cases.24,25

In Europe Heart Survey 1, PP-PCI was done in 40% cases whereas thrombolysis was done in 37%.26 In Europe Heart Survey 2, PP-PCI was done in 58% cases followed by thrombolysis in 41% cases.27 In the US national registry of Myocardial Infarction, PP-PCI was done in 36% cases while thrombolysis was done in 21%.48,49 In Kerala ACS registry, 41.4% of patients received thrombolysis.17 In the United Arab Emirates-Acute Coronary Syndrome registry, Primary PCI was done in 16.6% cases and thrombolysis in 64.8% cases.21 In Thai Registry in Acute Coronary Syndrome (TRACS) I and II registries, thrombolytic therapy was used in 30.4% and 42.6% whereas Primary-PCI was done in 22.2% and 24.7% cases. Streptokinase was commonly used in thrombolytic therapy.18 In Argentina CONAREC XVII Register, among patients treated with reperfusion therapy, 80% underwent primary angioplasty and the remaining 20% received thrombolytics, mainly streptokinase (85%).20 In SCAR Registry 2011 and ARG-EN-IAM-ST 2015 Registry from Argentina reperfusion rate are 99% and 96%. Primary PCI was done in 89.2% and 95.6% cases respectively. Fibrinolytic therapy was used in 18% and 10% cases. Streptokinase was the fibrinolytic agent most commonly used in that registries.34 Compared to the above studies, less reperfusion therapy noted in our registry is probably due to the late presentation after the onset of the symptoms. The geographical barrier, poor transportation system, lack of reperfusion facilities in most of the areas of nations, and delayed diagnosis are the probable reasons. It is worth noting that despite reperfusion rates being low, the overall mortality rate of STEMI is still comparable to the rest of the world. Although the mortality rates are almost similar, there may be an increased prevalence of the people living with low ejection fraction and the quality of life of these patients post STEMI on long term may be different, which can only be determined by conducting the long term follow up studies for at least 5-10 years in the large scale throughout the country.

In our registry, 82.1% of total patients underwent coronary angiogram in our study. SVD (50.5%) was the most common finding followed by DVD (28.7%). Non-critical CAD and left main disease were present in 2.6% and 0.7% cases respectively. In the Argentinian CONAREC XVII Registry, Myocardial revascularization was performed in 455 cases (77% received angioplasty and 23% CABG).20 In Kerala ACS registries Among the STEMI patients, 12.9% Underwent PCI, and 1.1% cases underwent CAGB.44 In the CREATE registry from India 8% underwent PCI and 1.9% CABG.45 In Thai registry 1 and 2 Elective PCI was done in 19.8% and 10.6% cases. CABG was done in 3.6% and 1.2% cases.45 In TURK-AKS study 1.9% of STEMI patients underwent CAGB.46

In the young population of the country with or without conventional risk factors.
In our study, in-hospital mortality of STEMI was 6.2% which is lower than that reported in the National Registry of Myocardial Infarction 3 study (9%)24 and of Brazilian registry (8.10%).46 India 9%,25 Global Registry of Acute Coronary Events 8%,26 27 Euro Heart Survey I 7%28 and an Argentinian CONAREC XVII Registry 8.8%.29

Discharge prescription in the STEMI survivors provides information about the adherence to the clinical guidelines of the institute. Along with lifestyle modifications, medicines play an important role in the secondary prevention of the disease. Among the 1369 patients discharged from hospital, aspirin, clopidogrel, statin, ACEI/ARB, beta-blockers, and spironolactone were prescribed in 97.8%, 96.2%, 96.4%, 76.8%, 74.4%, and 23.4% patients respectively. Our registry showed an acceptable level of medications prescribed at hospital discharge. Medication at discharge is currently used as an indicator of care in patients with infarction.47,48 In Argentinian CONAREC XVII registry,29 aspirin, clopidogrel, statin, ACEI/ARB, beta-blockers, and spironolactone were used in 92.4%, 73.1%, 92.6%, 82.4%, 88.9%, and 10.5% patients respectively. In our patients diuretic was used in 36.5% cases which is very high compared to Argentinian CONAREC XVII Registry.28 In our study aspirin and clopidogrel was prescribed in 97.8% and 96.2% patients which are higher than the prescription rate in Taiwan22 (80.3% and 84.6%), Poland21 (85% and 62%) and Kerala ACS Registry India19 (75% and 77.1%). The initiation or continuation of high-intensity statins is a class I recommendation in all patients with STEMI. It is prescribed in 98.7% of patients in our patients, which is comparable to the studies from Poland21 (81%), Taiwan22 (64.7%), China 49 (96.2%), Kerala registry19 (69%). The use of beta-blockers and ACEIs/ARBs were given great importance in the guidelines for secondary prevention. In our study, 74.4% of the patients were treated with a beta-blocker at the time of discharge, whereas 76.8% of the patients were treated with ACEI/ARB. The standard medical therapy prescription rates are comparable to the rest of the world. Discharge medications from various international studies are 56.7% beta-blocker and 29.4% ACEIs/ARBs in Kerala registry,19 90% beta-blocker and 85% ACEIs in China,49 76% beta-blockers and 72% ACEIs in Poland21 and 57% beta-blockers and 68.6% ACEIs/ARBs in Taiwan.22

Limitations
Although this study is single centered registry, as most of the patients were referred from other hospitals, it may represent presentation, management, outcome, and complication of STEMI of the entire nation. Predictors of mortality including door to needle, wire crossing time, length of hospital stay, international risk scoring systems, and angiographic outcomes were not considered. Future studies considering all these limitations are necessary in our part of the world.

Recommendations
To decrease the burden and to improve the overall outcome of STEMI in our country, mass awareness campaign including the importance of regular health check-up and early recognition of symptoms, establishment of effective EMS services and institution of early reperfusion therapy is highly recommended.

Conclusion
SGNHC-STEMI registry provides the first large-scale data on presentation, management, and outcome of STEMI in Nepal. It has generated valuable data on multiple aspects of STEMI. In general, the SGNHC-STEMI registry findings are consistent with other international studies.

Conflict of interest: None

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