Shahid Gangalal National Heart Centre-ST-elevation Myocardial infarction Registry (SGNHC-STEMI- Registry), Nepal.

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Abstract

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 therapy, 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.

Background

Cardiovascular disease is the most common cause of death worldwide. In particular, the "Global Burden of Disease study" classified ischemic heart disease as a leading cause of global mortality, accounting for 1.4 million deaths in the developed world and 5.7 million deaths in developing regions each year.[1] There has

been 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.[4,5] Among the different forms of CAD, ST elevation myocardial infarction (STEMI) has the highest in-hospital mortality.[6]

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.[7] 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.[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, I and aVL
High lateral 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 episode 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 than1.04mmol/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
c. 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

Single vessel disease (SVD)	More than 50% stenosis in one epicardial vessel
Double Vessel disease (DVD)	More than 50% stenosis in two epicardial vessels
Triple vessel disease (TVD)	More than 50% stenosis in three epicardial vessels
Left main disease (LMD)	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

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±13.4years. 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

Time to First Medical Contact (FMC)

Among the patients who were referred, the time interval from the onset of symptoms to FMC was 32.2 ± 4.5 (0.25-168) hours. The patients who directly attended SGNHC ER, symptoms onset to FMC time was 32.1± 4.1 (0.5-168) hours. In patients who underwent reperfusion therapy (including both SGNHC and other hospitals at presentation), the mean time interval of symptom onset to FMC was 4.9 ± 3.0 (0.25-12) hours.

Risk factors

During the presentation, smoking (54%) was the most common risk factor, followed by hypertension (36.6%), diabetes mellitus (25.3%), and dyslipidemia (7.8%). Myocardial infarction (STEMI) was the most common past medical history followed by unstable angina as shown in table 8.

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

Risk factors and Past medical illness	Number	%
Myocardial Infraction (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

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.

Type of MI

Inferior wall MI was the most common STEMI followed by Anterior wall MI and Infero-posterior wall MI as shown in table 9.

Table 9: STEMI distribution (n=1460)

Type of MI	Number	%
Anterior	404	27.6
Anterior septal	173	11.8
Extensive anterior	159	10.8
Inferior	410	28.1
Infero-posterior	203	13.9
Inferior with RV	48	3.2
Posterior	13	0.8
New onset LBBB	7	0.4
Lateral	24	1.6
Infero-posterior lateral	8	0.5
Anterior-inferior	17	1.1

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.

Table 10: Killip class at presentation (n=1460)

Killip Class	Number	%
I	1076	73.7
II	271	18.5
III	39	2.7
IV	74	5.1

Laboratory investigations

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 >200umol/L in 23 (1.6%) patients.

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

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 g/dl
Serum creatinine (Cr)	84.4±48.4 umol/L	29-787 µmol/L
Random blood glucose (RBS)	7.2±5.4 mmol/L	3.4-28.8 mmol/L

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.

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) in14.5% 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

In-hospital treatment

During the hospital stay, delayed PCI was done in 208 (14.2%) cases, coronary artery bypass graft (CABG) in 3.1% cases, rescue PCI in 1.7% cases, and endotracheal intubation was required in 3.4% cases as shown in table 13. During the admission 719 (49.3%) cases were treated with Enoxaparin. Fondaparinux was used in 53 (3.6%) cases. Dopamine, Dobutamine, adrenaline and noradrenaline were used in 61(4.2%), 42 (2.9%), 40 (2.8%) and 33 (2.3%) cases 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

Coronary angiogram findings

A total of 1199 patients underwent coronary angiogram including 392 patients at the time of ER presentation and 807 after admission, SVD was the most common, multi-vessel disease in 46.2% cases and left main coronary artery involvement in 0.7% cases as shown in Table 14.

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

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 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

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 7.7cm (mean 4.8±0.5), LVID systole ranged from 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 7.7cm (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)

	Number	%
Alive	982	91.3
Dead	93	8.7

Discussion

SGNHC-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 Kerala[19] (60.4±12.1), Poland[21] (64.0±12.4) and Taiwan[22] (61.1±13.6). But it was lower in UAE-ACS registry (50.8 years),[23] Kuwait (55.5years),[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.

Among 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.[36] 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.[37]

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 ARGEN-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.[19] In a CREATE registry from India, myocardial infarction was present in 11.5% of STEMI patients.[25] In Algerian Registry, CVA was present in 1.1% of cases.[39] 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.[40] In SCAR 2011 and ARGEN-IAM-ST 2015 registry from Argentina previous MI was present in 10.9% and 9.7% cases.[17]

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.[16] In the Kerala ACS registry among STEMI patients DM in 37.6%, HTN in 48.4%, and smoking in 34.4% cases.[19] 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.[20] In Algerian Study HTN was present in 33% cases, DM 29.2% cases, dyslipidemia in 6.3% cases and tobacco in 34.1% cases.[39] 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.[15] 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 ARGEN-IAM-ST registry 2015, 69% were smokers, dyslipidemia in 42.9% cases, HTN in 54.2% cases, and DM in 21% cases.[17] 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 Argentina 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%).[20] In the CREATE registry from India 58.5% of patients were thrombolysed and 8% underwent PPCI.[25] In the Global Registry of Acute Coronary Syndromes, PPCI was done in 40% cases and thrombolysis was done in 47% cases.[26,27,28] In Europe Heart Survey 1, PPCI was done in 40% cases whereas thrombolysis was done in 37%.[29] In Europe Heart Survey 2, PPCI was done in 58% cases followed by thrombolysis in 41% cases.[30] In the US national registry of Myocardial Infarction, PPCI was done in 36% cases while thrombolysis was done in 21%.[41,42] In Kerala ACS registry, 41.4% of patients received thrombolysis.[19] In the United Arab Emirates-Acute Coronary Syndrome registry, Primary PCI was done in 16.6% cases and thrombolysis in 64.8% cases.[23] 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.[16] 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 ARGEN-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.[17]

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, 75% underwent coronary angiogram during hospitalization 30% had SVD, 58% had DVD and TVD, and left main disease in 12% cases.[20] In the CREATE registry from India only 21.8% of patients underwent coronary angiogram.[25] In the Thai 1 and 2 Registry, CAG was done in 62.7 and 50.1 cases.16 In the Kerala ACS registry only 19.6% STEMI cases underwent coronary angiogram.[19] In our study LAD (48.8%) was the most common culprit vessel followed by RCA (40.9%). A study in Pakistan showed LAD as the most commonly identified culprit vessel (55.7%) followed by RCA and LCX (34.6%) and 10 (9.6%) respectively.[43] In the similar type of study in Bangladesh PPCI to RCA in 50% was the common cause for PPCI followed by LAD 43.3%, and LCX 6.7%.[44]

In our study, 1.7% underwent rescue PCI, 14.2% patient underwent elective PCI and 3.1% underwent CABG during admission. In 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 CABG.[19] In the CREATE registry from India 8% underwent PCI and 1.9% CABG.[25] 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.[16] In TURK-AKS study 1.9% of STEMI patients underwent CABG.[45]

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%)[42] and of Brazilian registry (8.10%).[46] India 9%,[25] Global Registry of Acute Coronary Events 8%,[26, 27, 28] Euro Heart Survey I 7%[29] and an Argentinian CONAREC XVII Registry 8.8%.[20]

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 Argentina CONAREC XVII registry,[20] 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.[20] In our study aspirin and clopidogrel was prescribed in 97.8% and 96.2% patients which are higher than the prescription rate in Taiwan[22] (80.3% and 84.6%), Poland[21] (85% and 62%) and Kerala ACS Registry India[19] (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 Poland[21] (81%), Taiwan[22] (64.7%), China 49 (96.2%), Kerala registry[19] (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 Poland[21] 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

Disclosure

The authors who were members of the editorial team were not involved in any steps in the editing/publication process.

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