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Trends and Predictors of Readmission among Coronary Artery Disease Patients in a Community Heart Hospital of Nepal

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ABSTRACT

Background: Patients of Coronary artery disease after index hospitalization gets readmitted to the same or different hospital for cardiac or noncardiac causes. The objective of this study if to find the trends of readmission pattern and different factors determining readmission .

Methods: The study is retrospective hospital based study for one year. Eligible patients were patients having documentation of coronary artery disease and readmission in time frame of one year in 2079 BS.

Results: Out of 749 admitted patient with coronary artery disease, 143 (19%) patients were readmitted. Mean age was 63.3 ± 13.4. There were 88 (61.5%) male and 55(38.5%) female. Readmission rate for 30 days was 2.9% and 1 year 11.2%. Forty (38%) of readmitted patients had been admitted more than one time. Common presentations were chest pain 60 (42%), shortness of breath 42(29.4%), fever 11 (7.7%), epigastric pain 9 (6.3%), hemiparesis 8(5.6%), dizziness 4 (2.8%), hematemesis 2(1.4%) and hempoptysis 2 (1.4%). Top factors determining readmission were enlisted were presence of wall motion abnormalities 96(67.1%), anemia 83 (58%), diagnostic invasive procedure in past 80 (55.9%), hypertension 76(52.4%), low systolic function 75 (52.4%), angina 60(43%), diabetes 59(41.3%), heart failure 50 (35%), revascularization(PCI) 50 (35%), infarction 39(27.3), COPD 32(22.4%), infections 29(20.3%),acute kidney injury 25 (17.5), hypothyroidism 16(11.2%), dyslipidemia 15(10.5), CKD 14(9.8), CVA 13(9.1), APD 12 (8.4), arrhythmia 10 (7%) h/o CABG, 10 (7%) and UGI bleeding 10 (7%).

Conclusion: Readmission forms nineteen percentage of total admissions and readmission rate calculated within 30 days of admission as 2.9%.

Keywords: coronary artery disease; community heart hospital; readmission.

INTRODUCTION

Readmission is defined when a patient is discharged from a hospital gets admitted again to the same hospital (index admission) or different hospital within a specified time frame. Center for Medicare and Medicaid services (CMS) has defined hospital readmission as admission to acute care hospital within 30 days of discharge from the same or another acute care hospital.[1] Hospital readmission rates work as signals of hospital performance and is basis for hospital reimbursement in different countries.[2] Readmission rate is described in 30 days[3] but different literatures have described in 60 days[4], 90 days[5] or 1 year.[6] Urgent readmission before 30 days after discharge with diagnosis of acute myocardial infarction can make hospital levied financial penalties in USA under the Hospital Readmissions Reductions Program (HRRP).[7] Literature regarding readmission including readmission rate and factors governing readmission is lacking in Nepal. This study will add to understanding of readmission pattern in Nepal.

METHOD

A retrospective hospital based study was conducted in Gautam Buddha Community Heart Hospital, Butwal in Lumbini Province by taking data of 2079 BS (April 1, 2022 to April 13, 2023). The study was approved by Institutional review committee of the

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hospital (Ref. No. 2080-B6-18). Eligibility criteria for patients' selection were patients having documentation of coronary artery disease, admission in time frame of one year in 2079 BS (April 14-2022 to April 13-2023), past admission for CAD indexed in GBC or indexed in other hospitals. Patients who were readmitted and expired in hospital were excluded. Data was tabulated in Excel and analysed in SPSS 17. Categorical variables were expressed in terms of frequency and percentage while continuous variables were presented as means and standard deviations.

RESULTS

Total admission in one year with diagnosis of coronary artery disease was 749. Out of these, 143 (19%) patients with mean age 63.3 ± 13.4 had readmissions. There were 88(61.5%) male with mean age 63.2 ± 13.4 years. There were 55 (38.5%) females with mean age 63.1 ± 12.7. Index hospitalization in GBC was 93(65%) and other centers were 50 (35%).Distribution of readmission cases tabulated in (Table 1). Duration from index hospitalization and last hospitalization were enlisted in (Table 2).

Forty (38%) of readmitted patients were admitted more than one time. During readmission hospital admission days was 3.1±1.4 days. There were 102 (71.3%) cardiac and 41 (28.7%) non cardiac causes of admission. Common presentations were enlisted in (Table 3). Factors determining readmission can be categorized as cardiac factors, noncardiac factors and common risk factors for coronary artery disease (Table 4) Laboratory parameter included Hb 11.8 ±2.0, Serum Creatinine 1.4 ± 0.6, RBS 139 ± 90, Total cholesterol 148 ±110, LDL 67 ± 36.4, HDL

Table 1. Prevalence of Readmission (n=749).

Prevalence of Readmission	Frequency (%)	95% CI	
		Lower	Upper
With h/o of CAD			
Yes	143 (19)	16.19%	21.80%
With index hospitalization in 2079			
Yes	66(8.8)	6.89	10.71
Within 30 days of last hospitalization			
Yes	22(2.9)	1.69	4.1
Within 6 months of last hospitalization			
Yes	54(7.3)	5.43	9.16
Within 1 year of last hospitalization			
Yes	84(11.2)	8.89	13.45

Table 2. Distribution of duration of index hospitalization time and last admission (n=749).

Duration	No of patient's n (%)	
	Fixed duration from index hospitalization	Fixed duration from last admission
≤1 month	19 (13.3)	22 (15.4)
1-6 months	22 (15.4)	32 (22.4)
6-12 months	25 (17.5)	30 (21)
12 -24 months	27 (18.9)	31 (21.7)
24-36 months	14(9.8	12 (8.4)
36-48 months	14 (9.8)	6 (4.2)
>4 years	22 (15.4)	10 (7)

Table 3. Common presentations at readmission after CAD (n=749).

Clinical Presentations	No of patients (%)
Chest pain	60 (42)
SOB	42 (29.4)
Fever	11 (7.7)
Epigastric pain	9 (6.3)
Hemiparesis	8 (5.6)
Dizziness	4 (2.8)
Hematemesis	2 (1.4)
Hemoptysis	2 (1.4)
Diarrhoea	1 (0.7)
Black stool	1 (0.7)
Palpitation	1 (0.7)

45.5± 16 and TG 133±63. Among readmitted patients, total coronary angiography performed during old or new admission was in 80 (55.9%) of which Triple vessel Disease (34%), Double Vessel Disease (18%) and Single Vessel Disease (31%). PCI was done in 50(35% among readmission patients. Among PCI, cardiac cause of readmission was 39 (78%) patients. New PCI on readmission was in 14 (38%) of which <1 month, 1 month to a year, and more than 1 year are 6, 3, and 5 cases respectively. Among old PCI 36 (72%) <1 month, 1 month to a year, and more than 1 year are 2, 10, and 24 cases respectively. Two cases were stent thrombosis, one indexed outside hospital.

Table 4. Factors determining readmission after coronary artery disease (n=749).

Cardiac	**Frequency (%)**
Presence of Wall motion abnormality (ECHO)	96 (67.1)
CAG	80 (55.9)
Low EF (≤40%)	75 (52.4)
Angina	60 (42)
Heart Failure	50 (35)
PCI	50 (35)
Infarction (Trop I +VE)	39 (27.3)
Arrythmia	10 (9.1)
H/o CABG	10 (9.1)
Non cardiac	
COPD	32 (22.4)
Infection	29 (20.3)
AKI	25 (17.5)
CKD	14 (9.8)
CVA	13 (9.1)
APD	12 (8.4)
UGI bleeding	10 (7)
Common Risk factors	
Anaemia	83 (58)
HTN	76 (53.1)
Diabetes	59 (41.3)
Hypothyroidism	16 (11.2)
Dyslipidaemia	15 (10.5)

AKI (Acute Kidney Injury) APD (Acid Peptic Disease) ECHO Echocardiography, CAG (Coronary angiography), CKD (Chronic Kindey Disease), CVA (Cerebrovascular Accident), , HTN (Hypertension), PCI (Percutaneous Coronary intervention)

Complete revascularization was done in 27(54%) patients. Medicines during of readmission patients included Ecosprin 120 (83.9%), Clopidogrel (68.5%), Rosuvastatin 137 (95.8%) Diuretics 75 (52.4%), Betablockers 88 (61%) and ARB 48 (33.6%) and Antianginal used in 45(31.5%). Average number of medicines was 10 ±3 ranging from 5 to 20 medicines.

DISCUSSION

Community heart hospitals have been managing coronary artery diseases patients (medically or through intervention) as new index hospitalization in the center or readmission as old index hospitalization in center itself or indexed in other hospitals across the country.[8] Nineteen percentage of total admission for CAD were readmitted old cases. Readmission rate for 30 days however was 2.9%. Readmission rate for 30 days has been calculated in different studies. 20.2% readmission after survival from cardiogenic shock in study by Shah et al.[9], 19.4% after PCI by Atti V et al. [10] and 10.3% after multivessel PCI by Tripathi et al.[11]. Readmission rate has been calculated in different countries which are as USA 39.1%, Canada 2.9%, Sweden 1.1%, Italy 2.7%, New Zealand 1.4%, Australia 9.7% and Switzerland 0.5%.[12,13] Readmission rate of patients after acute MI using medicare insurance services 67.5% ,private insurance 26.3% and self pay 3.3% was described.[9] Out-of-pocket expenditure for healthcare in Nepal was 69 percent despite being insured through Social health insurance.[14] As community heart hospital has no health insurance, patients have to self pay, readmission rate might have been low. Such low rate also described in self pay scheme in developed counties. Also because of self pay, patients might have been admitted in emergency or managed in out patient settings, which might have caused the decrease in readmission rate in hospital. Rural hospitals had 8% reduced odds of 30-day readmission compared to urban hospitals.[15] Peripheral hospitals, compared to urban hospitals, have less manpower, equipments, infrastructures, range of services and work up plans for delivery of guideline directed services.[16] Patients after hospitalization for acute and unplanned events

in rural centers, tend to follow up once to specialist in urban centers.[17,18] This means as high number of patients will be referred to central cities, follow up and readmissions of these patients may be lost. Cardiac cause for admission was in 71.3%. Cardiac causes for readmission were also quoted as 42% by Shah et al.[9] ,57.8% Atti et al.[10] and 62.6% by Tripathi et al.[11] Among Cardiac causes, angina (42%) was the most common presentation of which 27.3% had positive Trop I. Moretti et al [19] has readmission after PCI of which unstable angina (35.3%), chest pain (21.1%) and myocardial infarction (11.3%). Old PCI accounted 36(25.1 %) of patients while 14 (9.7%) undergo revascularization in readmission. Among PCI patients incomplete revascularization was in 23 (46%) of revascularization. Shortness of breath was present in 29.4% of patients and heart failure as factors contributing to readmission in 35% of patients. Heart failure has been the most common cardiac factors for admission as Shah et al.[9] (26.6%) and Atti et al.[10] (24.8 %). Most common precipitating factors for readmission were presence of wall motion abnormalities (67.1%), Low EF (52.4%) and anemia (58%). Late revascularization do not improve ejection fraction nor wall motion abnormalities.[20] As prehosptial time[21] and door to needle time[22] and door to balloon time[33] is longer in our settings, revascularization cannot be done in time and significant improvement in both ejection fraction and wall motion abnormalities does not occur even after treatment. Anemia, defined according to WHO in male with haemoglobin < 13gm/dl and female <12 gm/dl, was in 83 (58%) patients which was similar to other study.[16, 17, 23-25]. The prevalence of Chronic kidney injury in readmission patients was 9.8%. In study by Maleshappa et al.[26] prevalence of CKD in CAD was 39.2% and AKI as complication in 38.4%. In our study, 17.5% patients had acute kidney injury during re admission. Acute renal injury may be caused by cardiac failure, sepsis and multiple medications. Renal disease has been considered as factors for readmission by Shah et al., Atti et al[10] and Tripathi et al[11]. In this study population of hypertension, diabetes and dyslipidemia were 53.1%, 41.3% and 10.5% respectively. Study by Kwok et al.[27] readmitted patients have significant differences ($p<0.05$) in prevalence of diabetes, hypertension and dyslipidemia as diabetes (68.3% vs 71.8 %) and hypertension (75% vs 78.8%) have higher readmission while dyslipidemia (71.8% vs 68.3%) have lower. Dyslipidmia rather than diabetes or hypertension was significant for readmission in study by Hess et al.[28] Infections have been one of the precipitating factors for readmission. 20.3% patients had infections which was more compared to 9.4% by Shah et al.[9] Sepsis, pneumonia and UTI were associated with infections causing readmission in ischemic stroke patients.[29,30] Study on coronary angiography in stroke patients described one artery significant stenosis in 31% of stroke patients.[31] In our study, CVA (ischemic or hemorrhagic) was associated with 9.1% readmitted patients. Literature describing risk of ischemic stroke 3 times higher than hemorrhagic stroke after PCI.[27] Prevalence of COPD for CHD by Chen et al.[32] was 23.7%. In end stage COPD, 60% had clinically significant coronary angiography.[33] Respiratory causes of readmission has been described by Shah et al.[9] and Tripathi.[11] In our study 22.4% of readmitted patients had COPD and or exacerbations. In this study 7% of readmitted patients had UGI bleeding and common mode of presentations were hematemesis (1.4%), hemoptysis (1.4%) and black coloured stool 1 (0.7%). During a mean follow-up period of 125 days after Acute coronary syndrome (ACS) 12.5% developed UGI bleeding.[34] Hypothyroidism has been in 11.2% of readmitted patients in our study. The prevalence of CAD in hypothyroidism was 21.8%. and male,elderly,smokers, dyslipedimia, diabetes and postitive family history were considered as risk factors for CAD by Mazhari et al.[35] Proportion of avoidable readmissions was 27% varying from 5 to 79% in different studies.[36] Clinical pharmacist services for AMI patients, including counselling, interventions, and a follow-up phone call after discharge, decreased the 30-day AMI readmission rate by 5.6%.[37] Different interventions to avoid readmission have been suggested.[38] Predischarge interventions included patient education, medication

reconciliation, discharge planning and scheduling follow up appointments before discharge. Post discharge interventions include follow up telephone calls, hotlines timely communication with ambulatory providers, timely ambulatory provider follow up and post discharge home visits. Bridging interventions included transition coaches, physician continuity across the inpatient and outpatient setting and patient centred discharge instructions. This study has many limitations- It was retrospective study, many files remained incomplete which caused data missing and all variables could not be studied properly. Records of follow up to hospitals, length of stay in past hospital admission and compliance to prescribed medicines could give more understanding about the readmission process. Records of patients managed in outpatients and emergency visits of CAD patients could add up the real burden of disease. New prospective or cross sectional study incorporating all factors can give the clear picture of readmission process

CONCLUSION

Readmission forms nineteen percentage of total admissions and readmission rate calculated within 30 days of admission as 2.9%. Persisting wall motion abnormalities, Low Ejection fraction and anemia were common cardiac factors for readmission. COPD, infections and renal disease were most common non cardiac factors. Chest pain and shortness of breath were two most common presentations.

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