

**Original Article****Short-Term Outcome of Cardiac Surgeries in a Tertiary Care Hospital at the Eastern Part of Nepal**Praman Sharma\*<sup>1</sup>, Lokesh Yadav<sup>1</sup>, Ahmad Shahbaz<sup>2</sup>, Jyotindra Sharma<sup>3</sup>, Rajesh Nepal<sup>4</sup>, Sunil Babu Khanal<sup>4</sup>, Subhadra Agrawal<sup>5</sup>, Vivek Kattel<sup>6</sup>

<sup>1</sup>Department of Cardiothoracic and Vascular Surgery, <sup>4</sup>Department of Cardiology, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal, <sup>2</sup>Department of Cardiac Surgery, Punjab Institute of Cardiology, Lahore, Pakistan, <sup>3</sup>Department of Cardiothoracic and Vascular Surgery, HAMS, Kathmandu, Nepal, <sup>5</sup>Tulsa Mother and Child care Hospital, Biratnagar, Nepal, <sup>6</sup>Department of Internal Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

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Cardiac surgical procedures like coronary artery bypass graft surgery and aortic or mitral valve replacements are commonly performed worldwide. In the developing world, Cardio-Thoracic and Vascular Surgery are not adequately accessible except in a few major cities. We established the department to fill that gap at a tertiary center in the eastern part of Nepal. The main objective of the study was to evaluate the short-term outcome of all major cardiac surgeries.

**Materials and Methods**

This is a retrospective study including all cardiac surgery cases operated over 18 months of the establishment. Demographics, various cardiac diseases, co-morbidities, pre-specified peri-operative, and postoperative outcomes were noted in pre-structured questionnaires. The ethical clearance was taken from the hospital ethical committee.


**Results**

There were 67 major cardiac surgery cases performed. Among those 50.7% and 49.3% were males and females respectively with a median age of 50 years. The most common etiology was coronary artery disease (43.28%) followed by rheumatic heart disease (28.35%) and congenital heart diseases (23.88%). The mean cardiopulmonary bypass and aortic cross-clamp times were 93 min and 58 min respectively. The mean intensive care unit and hospital stays were 1.9 and 5.87 days respectively. One (1.5%) patient underwent reexploration and six (8.9%) patients developed acute kidney injury. Peri-operative survival was 100% whereas the first and third-month survivals were 97% and 95% respectively.

**Conclusion**

Major cardiac surgeries are feasible and safe in newly established cardiac surgery department with acceptable short-term morbidity and mortality.

**Keywords:** Cardiovascular Disease, Cardiac Surgery, Treatment Outcome

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## Introduction

Cardiovascular disease, a leading cause of mortality and morbidity worldwide [1] accounts for 17.5 million deaths per year, out of which 80% occurs in underdeveloped and developing countries [2]. The disparity in outcome is large because of suboptimal access to comprehensive cardiac care facility largely because of the unavailability of cardiac surgery for these patients who are augmented by the lack of trained resources, infrastructures, and financial support [1, 2].

The establishment of Sahid Gangalal National Heart Institute in Kathmandu in 1995 paved the way for the commencement of cardiac surgeries in Nepal. BPKIHS, Dharan established the services outside capital in 2016 [3-8]. However the service needed was not matched with the existing facilities and we established Cardio-Thoracic and Vascular Surgery (CTVS) department in Nobel Medical College and Teaching Hospital in 2019.

The Teaching Hospital has an average daily traffic of 2000 outpatients mostly referred for tertiary services. By the establishment of 18 months, we performed 171 major surgeries at our center. The main objective of the study was to evaluate the three months outcome of all major cardiac surgeries performed in our newly established cardiac surgery department.

## Materials and Methods

All 67 cases of cardiac surgery performed between June, 2019 to January, 2021 were analyzed retrospectively. The data were collected in the pre-structured questionnaire from the discharge summary and case record file of the patients who were operated in the CTVS department of Nobel Medical College Teaching Hospital, Biratnagar, Nepal. The patients meeting the requirement of cardiac surgery based on history, physical examination, electrocardiography, echocardiography, and coronary angiography were included. The data included gender, age, cardiac disease, co-morbidities, type of surgery, cardiopulmonary bypass detail, peri-and postoperative complications, duration of hospital stay, and mortality. The cardiac surgery indication and procedure were based upon the guidelines of American College of Cardiothoracic Surgery [9-11]. Cases were followed up for 3 months postoperatively by telephone or outpatient visit. The outcome was defined as perioperative

complications, hospital stay, survival, and mortality. Mortality was classified as in and post-hospital mortality. Post-hospital mortality was further classified as mortality due to cardiac versus noncardiac events. The data were entered in Microsoft Excel 2007 and analyzed using IBM SPSS version 20. The ethical clearance was taken from the hospital ethical committee (IRC NMCTH 428/2021).

## Results

Among 171 surgeries the proportion of vascular surgery was 44% followed by 39% cardiac surgery and 14% thoracic surgeries. Among the cohort of 67 cardiac surgery cases, four were performed off-pump and 63 were on-pump. The median and mean age were 50 years and 48 years (SD 14.6 years) respectively. (Table 1)

**Table 1: Clinico-epidemiological variables of the cardiac surgery patients**

SN	Variables	Frequency (N=67)
1	Gender	
	a. Male	34 (50.7%)
	b. Female	33 (49.3%)
2	Age	
	a. Mean	48.18 years
	b. Median	50 years
	c. Range	6 months-75 years
3	Comorbidities	
	a. Systemic Hypertension	30 (44.77%)
	b. Type 2 Diabetes Mellitus	16 (23.88%)
	c. Atrial fibrillation	14 (20.90%)
	d. Thyroid diseases	14 (20.90%)
	e. Anemia	11 (16.42%)
	f. Infective endocarditis	1 (1.50%)
	g. Systemic lupus erythematosus	1(1.50%)
4	Associated risk factors	
	a. Smoking	21 (31.3%)
	b. Family history of mortality due to cardiovascular events	14 (20.90%)
	c. Family history of cardiac surgery	4 (5.97%)
	d. Family history of rheumatic heart diseases	4 (5.97%)

Among 67 cases the most common indication for cardiac surgery was coronary artery disease (43.28%). One patient had left main stenting done 1 year back. The mean, median, and range of the CABG surgery were 59 years, 58 years, and 50-75 years respectively. Rheumatic heart disease was the second most common cause for cardiac surgery comprising 28.35%. Two of the RHD patient had undergone PTMC. Among RHD cases 78.95% had mitral valve replacement whereas 21.05% had double valve (mitral and aortic) replacement (Table 2).

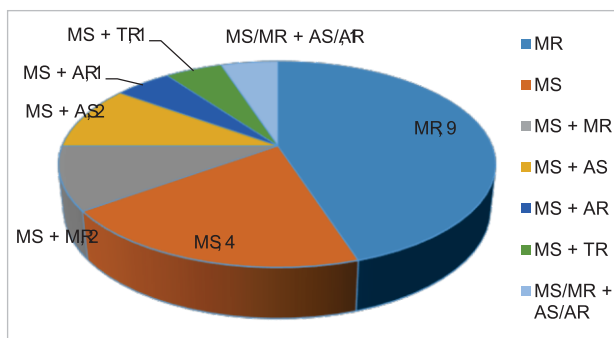


**Table 2: Classification of disease undergoing the cardiac surgical procedure**

Underlying heart disease (N=67)	Frequency (N)	Surgical Procedure
<b>Coronary artery disease (N=29)</b>		
a. Triple vessel disease	17	CABG
b. Double vessel disease	4	CABG
c. Left main stem diseases	4	CABG
d. Triple vessel disease with ASD	2	CABG with ASD closure
e. Triple vessel disease with severe MR	1	CABG with MV repair
f. Triple vessel disease with severe AS	1	CABG with AV replacement
<b>Rheumatic heart disease (N=19)</b>		
a. Mitral valve disease	15	MVR
b. Double valve disease	4	DVR or MVR with TV repair
<b>Congenital heart disease (N=16)</b>		
a. ASD ostium secundum	7	ASD closure
b. ASD sinus venosus	2	ASD closure
c. ASD with severe PS	1	ASD closure with pulmonary valvotomy
d. Bicuspid aortic valve with severe AS	3	AVR
e. Tetralogy of Fallot	1	Total Correction
f. Patent ductus Arteriosus	2	PDA Ligation
<b>Others (N=3)</b>		
a. Constrictive pericarditis	2	Pericardiectomy
b. Aortic dissection	1	Bentals

**Abbreviations:** CABG; Coronary Artery Bypass Graft, ASD; Atria Septal Defect, MR; Mitral Regurgitation, MV; Mitral Valve, AS; Aortic Stenosis, AV; Aortic Valve, MVR; Mitral Valve Replacement, DVR; Double Valve Replacement, TV; Tricuspid Valve, PS; Pulmonary Stenosis, AVR; Aortic Valve Replacement, PDA; Patent Ductus Arteriosus.

Among the rheumatic heart disease, the most common lesion was mitral regurgitation (45%) followed by mitral stenosis (20%). (Chart 1)

**Chart 1. Proportion of valvular lesions among RHD**

**Abbreviation:** MR; Mitral Regurgitation, MS; Mitral Stenosis, AS; Aortic Stenosis, AR; Aortic Regurgitation, TR; Tricuspid Regurgitation.

Among the cardiac patient, 52.2% had compromised ejection fraction of the left ventricle. Perioperatively the maximum duration of ventilator support, aortic cross-clamp, and cardiopulmonary bypass time were 12 hours, 192 minutes, and 149 minutes respectively. The maximum hospital and ICU stays were 12 days, and 4 days respectively. (Table 3)

**Table 3. Perioperative variables**

Peri-operative variables	Values (N=67)
Left Ventricular ejection fraction	
a. Normal or above 50%	32
b. Mild 40-50%	13
c. Moderate 30-40%	17
d. Severe <30%	5
Blood transfusion	
a. None	22
b. 1-3 pints	34
c. 4-6 pints	10
d. >6 pints	1
Cardiopulmonary bypass time	
a. <60 minutes	9
b. 61-120 minutes	45
c. 121-180 minutes	12
d. 181-240 minutes	1
Aortic cross-clamp time	
a. < 60 minutes	38
b. 61-120 minutes	27
c. 121-180 minutes	2
Ventilator hours	
a. 1-3 hours	4
b. 4-6 hours	45
c. 7-9 hours	10
d. 10-12 hours	8
Intensive Care Unit stay	
a. 24 hours	22
b. 25-48 hours	32
c. 49-72 hours	12
d. 73-96 hours	1
Hospital stay	
a. 1-4 days	11
b. 5-8 days	49
c. 9-12 days	7
Number of inotropes used postoperatively	
a. None	9
b. Single	23
c. Double	26
d. Triple	9
Reexploration	1
Acute Kidney injury (post-operative)	6
Sternal dehiscence	1
Superficial wound infection	3

Among the 67 cases, six patients developed postoperative acute renal failure which gradually recovered. Three patients developed superficial wound infections at the first month follow-up, which was conservatively managed on an outpatient basis. Four were readmitted due to postoperative issues out of which two were due to acute kidney injury and one was due to sternal dehiscence. One case of MVR expired before four weeks follow-up at home followed by another mortality of AVR case at sixth weeks at home after sustaining a head injury. Third mortality was DVR at third weeks at the hospital who presented with acute renal failure and developed MODS within 48 hours of admission (Table 4).





Table 4: In-hospital and post-hospital survival

Type of Surgery (N=67)	In hospital	At 4 weeks	At 12 weeks
CABG (N=25)	100%	100%	100%
CABG+ ASD (N=2)	100%	100%	100%
CABG+ MV repair (N=1)	100%	100%	100%
CABG+AVR (N=1)	100%	100%	100%
MVR (N=15)	100%	93.3%	93.3%
DVR (N=4)	100%	100%	75%
AVR (N=3)	100%	66.7%	66.7%
ASD closure (N=9)	100%	100%	100%
ASD closure with pulmonary repair (N=1)	100%	100%	100%
PDA ligation (N=2)	100%	100%	100%
Pericardiectomy (N=2)	100%	100%	100%
Bentals (N=1)	100%	100%	100%
Total Correction (N=1)	100%	100%	100%

**Abbreviations:** CABG; Coronary Artery Bypass Graft, ASD; Atria Septal Defect, MV; Mitral Valve, AVR; Aortic Valve Replacement, DVR; Double Valve Replacement, TV; Tricuspid Valve, MVR; Mitral Valve Replacement, PDA; Patent Ductus Arteriosus.

The overall in-hospital survival rate was 100% whereas the first and third monthly survival rate was 97.01% and 95.5% respectively.

## Discussion

Our study demonstrates the feasibility and safety of major cardiac surgeries like CABG, MVR, and/or AVR with comparable short-term outcome results like [8, 12] in our newly established center. We have conducted 67 major cardiac surgeries over 18 months. Among these surgical cases, the most common morbidity burden was coronary artery disease (43.3%) followed by rheumatic heart disease (28.5%) which was comparable to Bhandari et al [4] and Maskey et al [5]. In contrast to our finding study by Jaishwal et al [8] among 51 cases for 24 months in eastern Nepal, the most common surgical indication was rheumatic heart disease (55%) followed by congenital heart disease (23.6%). Since the establishment of CTVS at teaching hospital Kathmandu in three years the number of cardiac surgery was 132 accounting for congenital heart disease 64% followed by rheumatic heart disease 35% which contrast with our findings [12]. In our study among 19 rheumatic heart disease patients mitral valve disease was the most common lesion demanding mitral valve replacement as the most common surgery [8, 12].

Globally prevalence of Cardiovascular disease (CVD) was 271 million in 1990 that nearly doubled by 2020. Due to the aging population and surge in cardiovascular burden mortality due to CVD increased by more than 1.5 fold in 2020 as compared to 1990 (12.1 million) [1]. Among hospital registry of Nepal CVD accounts within the top 5 morbidities accounting for more than

40% of admission among all non-communicable diseases [3]. In developing countries national policy focuses on the preventive and promotive approach of cardiovascular diseases with the least priority to cardiac surgery [12, 13]. If even available these interventional approaches are centered in the major city creating a gap of inaccessibility to outreach area [13]. Local, sustainable cardiac surgery centers can fill these inaccessible gaps cost-effectively [13]. The mean age of our cohort was 48.1 years with an age range from 6 months to 75 years. Younger patients had congenital heart disease whereas older had coronary heart disease. 34 (50.7%) were male and 33 (49.3%) were female comparable with Jaishwal et al [8]. 30 (44.77%) patients had systemic hypertension, 16 (23.88%) had type 2 diabetes mellitus, 14 (20.90%) had thyroid disease, and 1 (1.50%) each had infective endocarditis and systemic lupus erythematosus as comorbidities. Family history of mortality due to cardiovascular events was found in 14 (20.90%), family history of cardiac surgery in 4 (5.97%)

The mean cardiopulmonary bypass and aortic cross-clamp time were  $93.57 \pm 31.4$  and  $58.46 \pm 24.67$  respectively. Similarly study by Jaishwal et al the cardiopulmonary bypass and aortic cross-clamp time were  $106 \pm 35$  and  $80 \pm 26$  minutes respectively for all on-pump cardiac surgeries [8]. The mean ventilator support time, Intensive care unit (ICU), and hospital stay were 6 hours, 1.9 days, and 5.9 days  $4 \pm 2$  days respectively which is comparable with Jaishwal et al [8]. The overall perioperative survival rate in our study was 100% as compared to 92.2% [8]. The overall in-hospital mortality in the established national center in Nepal is reported to around 4.1% varying from 3.4% for isolated MVR to 9.4% for MVR with TV Repair [14]. Higher mortality rates compared to ours were documented in other studies [15-19]. Mortality rate of cardiac surgery is higher in resource-limited setup for reasons more than perioperative complications [20]. Low mortality rate is key for successful and sustainable centers to get numbers of referrals for surgery [21-23]. The primary goal of the surgical center should be to provide each patient with the best possible care to give them the best chance of survival [19]. The increase in the number of treated patients, decrease in mortality rates, an increase in trained personnel over time can attest to the success of a surgical center in a developing country [20]. Delay in diagnosis and referral of cardiac disease is another gap contributing to the patient landing with the more severe form of cardiac disease to the surgical team in developing world [22]. Many patients in developing



countries are diagnosed lately succumbs inevitable poor post-surgical outcome [23-24].

The first and third-month post-operative survival rate in our study was 97.01% and 95.5% respectively. The three-month postoperative survival rate among coronary artery bypass surgery patients was 100% in our study which is comparable to other centers in Nepal [25]. However among dual valve replacement and aortic valve replacement patients the third-month post-operative survival rate in our study were 75% and 66.7% respectively. The difference in survival outcome among valve replacement could be due to the low sample size [26]. The major limitations of the study are the sample size and retrospective nature of the study.

### Conclusion

The most common surgeries performed in our new cardiac surgery department were CABG, MVR, and/or AVR. Common etiology was coronary artery disease, rheumatic heart disease, and congenital heart diseases. This study shows the feasibility and safety of major cardiac surgeries with comparable short-term outcomes in terms of morbidity and mortality in a newly established tertiary care center.

**Conflicts of interests :** None

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