

# Incidence of perioperative cardiac complications in patients with heart disease undergoing major oncosurgeries: A retrospective study

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ABSTRACT

Background: Cardiac complications are the most important causes of morbidity and mortality in the first 30 days after non cardiac surgery which result in prolonged length of stay, increased health care costs and poorer prognosis. Patients with coronary artery disease undergoing non-cardiac surgery are at an increased risk for peri-operative complications such as Myocardial Infarction(MI), cardiac failure, arrhythmias, cardiac arrest and increased morbidity and mortality.

Aim: To know the incidence of perioperative cardiac complications in patients with heart disease undergoing major oncosurgeries.

Settings and design: A retrospective analytic study was done in a tertiary care cancer centre in 70 heart disease patients who underwent oncosurgeries to know the incidence of perioperative cardiac complications within 7 days after surgery. Heart disease which were included in this study were congenital heart disease, ischemic heart disease, moderate and severe mitral stenosis, aortic stenosis, mitral regurgitation, aortic regurgitation, hypertrophic obstructive cardiomyopathy. Perioperative cardiac complications were noted in these patients intraoperatively and 7 days postoperatively.

Results: For the multivariate analysis, the value of alpha was adjusted and p-values at or below 0.2 were considered to be significant. In this study, history of previous surgery and moderate and high risk as diagnosed by cardiologist were found to significantly affect the incidence of intra/post-op complication in cardiac patients undergoing oncosurgeries.

Conclusion: Patients having any heart disease and having history of previous surgery or moderate and high risk diagnosed by cardiologist have more cardiac complications.

**Key words:** heart disease, complications, oncosurgeries

## INTRODUCTION

Cardiac complications are the most important causes of morbidity and mortality in the first 30 days after non-cardiac surgery which result in prolonged length of stay, increased health care costs and poorer prognosis and associate with perioperative factors, including advanced age, Coronary Artery Disease (CAD), renal insufficiency, diabetes, congestive Heart Failure (HF), types of surgery and other conditions [1-4].

Patients with coronary artery disease undergoing non-cardiac surgery are at an increased risk for peri-operative complications such as myocardial ischemia, MI, cardiac failure, arrhythmias, cardiac arrest and increased morbidity and mortality. These complications are much higher in patients with recent MI or unstable angina who require urgent or emergency cardiac surgery [1,5].

## MATERIAL AND METHODS

This retrospective study was conducted after obtaining clearance from Institutional review board(1616/IRB-SRC/13/MCC/08-01-2022/1). It was also registered in Clinical registry trial(CTRI/2022/01/039773). The primary objective of this retrospective study was to estimate the incidence and nature of cardiac complications in patients with heart disease intraoperatively and within 7 days postoperatively undergoing major oncosurgeries. Secondary objective was to assess the risk factors associated with perioperative cardiac complications and to know the thirty-day mortality and 90 days' mortality in patients with known cardiac illness undergoing major resection surgeries.

This study was conducted in the department of onco-anaesthesiology, Malabar Cancer Centre. The data of patients who had any heart disease diagnosed by cardiologist and had undergone major oncosurgeries from 1<sup>st</sup> January 2021 to 31<sup>st</sup> December 2021 was retrieved from Medical Records Department.

Inclusion criteria was age 25 years-85 years, ASA I and ASA II patients and those undergoing major oncosurgeries. Patients undergoing emergency surgery, American Society of Anesthesiologists (ASA) classification IV, V or VI and those who underwent two operations or more during the same hospitalization were excluded from this study.

Patients having any heart disease were studied for intraoperative

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cardiac complications and postoperative complications within 7 days of surgery.

CAD was diagnosed if any of the following conditions were met: CAD confirmed by coronary angiography, history of Myocardial Infarction (MI), history of coronary revascularization, positive myocardial perfusion scintigraphy, positive exercise stress test, or typical symptoms of angina pectoris with simultaneous signs of myocardial ischemia on the electrocardiograph.

Heart disease which were included in this study: Congenital heart disease, Ischemic heart disease, moderate and severe mitral stenosis, moderate and severe aortic stenosis, moderate and severe mitral regurgitation, moderate and severe aortic regurgitation, hypertrophic obstructive cardiomyopathy.

Perioperative Cardiac Complications (PCCs) were defined as: ACS included ST-Elevation Myocardial Infarction (STEMI) and Non-ST-Elevation Acute Coronary Syndrome (NSTEMI-ACS). NSTEMI-ACS was further subdivided into non-ST-elevation MI and unstable angina according to the cardiac biomarkers.

Diagnosis of MI required a cTnl rise above the 99<sup>th</sup> percentile, accompanied by chest pain, ST-segment changes or new-onset left bundle branch block, ventricular wall motion abnormalities, or angiography confirmation. HF was diagnosed mainly by active clinical symptoms of dyspnea, orthopnea, peripheral edema, jugular venous distention, rales, third heart sound, or chest X-ray with pulmonary vascular redistribution or pulmonary oedema. New-onset severe arrhythmia was defined as ECG changes needing to be treated with drug or electrical conversion, including malignant ventricular arrhythmia (ventricular tachycardia or ventricular fibrillation), atrial flutter or Atrial Fibrillation (AF), atrioventricular block (second-degree type II or third-degree), or frequent ventricular premature contractions.

Cardiac arrest was defined as the loss of circulation prompting resuscitation requiring chest compressions, defibrillation, or both.

or physical examination findings. Patients records were collected and analyzed for intraoperative and postoperative complications.

## STATISTICS

Categorical variables were presented as numbers (%), and continuous variables was presented as the mean ± Standard Deviation (SD) or median and Inter-Quartile Range (IQR), depending on the distribution. A chi-square analysis was used between groups with and without PCCs to select possible risk factors of PCCs. SPSS software (IBM corporation) version 21 was used.

## RESULTS

70 patients were diagnosed with heart disease in 2021. Out of these 70 patients, 62 patients underwent major oncosurgeries in Malabar cancer Centre. Table 1 shows the demographic data of these 62 patients.

17 patients developed complications, out of which 6 patients developed intraoperative complications and 11 patients developed postoperative complications.

Table 2 shows the intraoperative complications in these 6 patients.

Table 3 shows the postoperative complications in 17 patients.

Table 4 shows the comparison of patient parameters as per incidence of complications.

From the various factors, history of previous surgery was found to be statistically significant. This means that those patients who had previous surgery were at more risk for developing cardiac complications.

Table 5 shows the comparison of patient parameters as per incidence of intra-op complications.

**Tab. 1.** Table representing various patient parameters, n=62

	Characteristic	N=62 <sup>1</sup>
Age	Median, (IQR)	65.00, (58.00, 70.00)
	Range	38.00, 77.00
	Mean ± SD	63.24 ± 9.35
Sex	F	29 (46.77%)
	M	33 (53.23%)
	IHD	52 (83.87%)
	Hypertension	37 (59.68%)
	Diabetes	27 (43.55%)
	Stroke	2 (3.23%)
Weight (kg)	Median, (IQR)	58.00, (52.25, 65.00)
	Range	35.00, 98.00
	Mean ± SD	59.44 ± 10.93
ASA Status	I	1 (1.61%)
	II	36 (58.06%)
	III	25 (40.32%)
	Characteristic	N=62
BUN	Median, (IQR)	22.00, (16.00, 28.75)
	Range	8.00, 71.00
	Mean ± SD	23.84 ± 10.74
Creatinine	Median, (IQR)	0.90, (0.80, 1.00)
	Range	0.40, 8.00
	Mean ± SD	1.02 ± 0.95

Serum Sodium	Median, (IQR)	136.00, (133.00, 139.00)
	Range	126.00, 144.00
	Mean ± SD	135.94 ± 3.87
Serum Potassium	Median, (IQR)	4.40, (4.00, 4.60)
	Range	3.40, 5.20
	Mean ± SD	4.32 ± 0.45
Random Blood Sugar	Median, (IQR)	120.50, (97.25, 148.75)
	Range	66.00, 357.00
	Mean ± SD	136.15 ± 55.31
INR	Median, (IQR)	1.00, (1.00, 1.00)
	Range	1.00, 1.27
	Mean ± SD	1.01 ± 0.04
TSH	Median, (IQR)	1.76, (0.97, 2.53)
	Range	0.38, 9.96
	Mean ± SD	2.13 ± 1.76
Characteristic	History of Surgery	19 (30.65%)
	Incidence of complications	17 (27.42%)
	Incidence of intra-op complications	6 (9.68%)
	Incidence of Post-op Complications	11 (17.74%)

Tab. 2. Intraoperative complications

Intraoperative complications	No. of patients
Hypotension	1
Bradycardia	2
Hypertension	3
Total	6

Tab. 3. Postoperative complications.

Postoperative complications	Number of patients
Bleeding	2
ECG changes, Trop I normal	1
Saturation fall	1
Hypotension	3
ECG changes, Trop I elevated	1
Hypertension	2
Bradycardia	1
Total	11

Tab. 4. Shows the comparison of patient parameters as per incidence of complications

Characteristic	No, N=45 <sup>1</sup>	Yes, N=17 <sup>1</sup>	p-value <sup>2</sup>
Age	Median (IQR)	65.00, (58.00, 70.00)	65.00, (58.00, 69.00)
	Range	43.00, 77.00	38.00, 73.00
	Mean ± SD	63.62 ± 9.41	62.24 ± 9.42
Sex	F	21 (46.67%)	8 (47.06%)
	M	24 (53.33%)	9 (52.94%)
	IHD	38 (84.44%)	14 (82.35%)
	Hypertension	25 (55.56%)	12 (70.59%)
	Diabetes	18 (40.00%)	9 (52.94%)
	Stroke	1 (2.22%)	1 (5.88%)
Weight (kg)	Median, (IQR)	60.00, (53.00, 67.00)	57.00, (49.00, 63.00)
	Range	39.00, 80.00	35.00, 98.00
	Mean ± SD	60.16 ± 9.74	57.53 ± 13.75
ASA Status	I	1 (2.22%)	0 (0.00%)
	II	24 (53.33%)	12 (70.59%)
	III	20 (44.44%)	5 (29.41%)
History of Surgery	17 (37.78%)	2 (11.76%)	0.047
Haemoglobin	Median, (IQR)	12.10, (11.10, 13.80)	11.50, (9.80, 13.60)
	Range	8.10, 17.60	8.20, 15.80
	Mean ± SD	12.31 ± 1.89	11.74 ± 2.17
Total Leucocyte Count	Median, (IQR)	8,500.00, (6,700.00, 10,100.00)	8,100.00, (6,300.00, 10,500.00)
	Range	4,000.00, 15,100.00	4,700.00, 25,200.00
	Mean ± SD	8,646.67 ± 2,561.04	9,088.24 ± 4,659.38

Platelet Count	Median, (IQR)	268,000.00, (237,000.00, 339,000.00)	243,000.00, (206,000.00, 374,000.00)	0.072
	Range	128,000.00, 501,000.00	178,000.00, 343,000.00	
	Mean ± SD	281,888.89 ± 87,464.60	244,588.24 ± 51,592.22	
BUN	Median, (IQR)	23.00, (19.00, 28.00)	21.00, (15.00, 29.00)	0.5
	Range	8.00, 71.00	13.00, 41.00	
	Mean ± SD	24.44 ± 11.51	22.24 ± 8.45	
Creatinine	Median, (IQR)	0.90, (0.70, 1.00)	0.90, (0.80, 1.00)	0.7
	Range	0.50, 1.90	0.40, 8.00	
	Mean ± SD	0.94 ± 0.31	1.25 ± 1.75	
Serum Sodium	Median, (IQR)	136.00, (134.00, 138.00)	136.00, (133.00, 139.00)	0.6
	Range	126.00, 144.00	131.00, 144.00	
	Mean ± SD	135.71 ± 3.82	136.53 ± 4.06	
Serum Potassium	Median, (IQR)	4.40, (4.00, 4.60)	4.50, (4.20, 4.70)	0.12
	Range	3.40, 5.20	4.00, 5.00	
	Mean ± SD	4.26 ± 0.48	4.48 ± 0.31	
Random Blood Sugar	Median, (IQR)	119.00, (98.00, 149.00)	121.00, (97.00, 148.00)	0.8
	Range	70.00, 357.00	66.00, 194.00	
	Mean ± SD	139.60 ± 60.85	127.00 ± 36.89	
INR	Median, (IQR)	1.00, (1.00, 1.00)	1.00, (1.00, 1.02)	0.4
	Range	1.00, 1.27	1.00, 1.13	
	Mean ± SD	1.01 ± 0.04	1.01 ± 0.03	
TSH	Median, (IQR)	1.72, (0.97, 2.59)	2.02, (1.01, 2.30)	0.9
	Range	0.38, 9.96	0.50, 5.17	
	Mean ± SD	2.17 ± 1.89	2.02 ± 1.40	

**Tab. 5.** The comparison of patient parameters as per incidence of intra-op complications.

Characteristic		No. N= 56 <sup>1</sup>	Yes. N=6 <sup>1</sup>	p-value <sup>2</sup>
Age	Median (IQR)	65.00, (57.75, 70.00)	68.00, (60.25, 69.75)	0.7
	Range	38.00, 77.00	52.00, 72.00	
	Mean ± SD	63.09 ± 9.55	64.67 ± 7.89	
Sex	F	26 (46.43%)	3 (50.00%)	>0.9
	M	30 (53.57%)	3 (50.00%)	
	IHD	47 (83.93%)	5 (83.33%)	>0.9
	Hypertension	32 (57.14%)	5 (83.33%)	0.4
	Diabetes	25 (44.64%)	2 (33.33%)	0.7
	Stroke	2 (3.57%)	0 (0.00%)	>0.9
Weight (kg)	Median, (IQR)	59.00, (52.75, 65.50)	56.00, (49.00, 63.00)	0.4
	Range	39.00, 98.00	35.00, 66.00	
	Mean ± SD	60.00 ± 10.80	54.17 ± 11.70	
ASA Status	I	1 (1.79%)	0 (0.00%)	0.4
	II	31 (55.36%)	5 (83.33%)	
	III	24 (42.86%)	1 (16.67%)	
Hemoglobin	Median, (IQR)	11.95, (10.90, 13.72)	12.35, (11.55, 13.38)	0.8
	Range	8.10, 17.60	8.60, 14.40	
	Mean ± SD	12.16 ± 1.98	12.12 ± 2.03	
Total Leucocyte Count	Median, (IQR)	8,500.00, (6,650.00, 10,425.00)	7,400.00, (6,450.00, 8,050.00)	0.3
	Range	4,000.00, 25,200.00	6,300.00, 9,300.00	
	Mean ± SD	8,907.14 ± 3,357.81	7,466.67 ± 1,182.65	
Platelet Count	Median, (IQR)	265,000.00, (215,500.00, 303,750.00)	270,000.00, (237,750.00, 326,250.00)	>0.9
	Range	128,000.00, 501,000.00	178,000.00, 343,000.00	
	Mean ± SD	271,607.14 ± 82,640.66	272,166.67 ± 64,396.95	
BUN	Median, (IQR)	22.00, (16.00, 28.50)	22.00, (16.75, 27.25)	0.8
	Range	8.00, 71.00	14.00, 30.00	
	Mean ± SD	24.04 ± 11.11	22.00 ± 6.72	

Creatinine	Median, (IQR)	0.90, (0.78, 1.00)	0.90, (0.83, 0.90)	0.7
	Range	0.40, 8.00	0.60, 1.00	
	Mean ± SD	1.04 ± 0.99	0.85 ± 0.14	
Serum Sodium	Median, (IQR)	136.00, (133.75, 139.00)	136.00, (132.25, 142.00)	0.7
	Range	126.00, 144.00	131.00, 144.00	
	Mean ± SD	135.82 ± 3.67	137.00 ± 5.76	
Serum Potassium	Median, (IQR)	4.45, (4.00, 4.60)	4.30, (4.20, 4.55)	>0.9
	Range	3.40, 5.20	4.00, 4.80	
	Mean ± SD	4.32 ± 0.46	4.37 ± 0.29	
Random Blood Sugar	Median, (IQR)	120.00, (97.00, 153.25)	125.50, (105.75, 140.00)	0.9
	Range	66.00, 357.00	89.00, 148.00	
	Mean ± SD	137.66 ± 57.61	122.00 ± 23.38	
INR	Median, (IQR)	1.00, (1.00, 1.00)	1.00, (1.00, 1.02)	0.5
	Range	1.00, 1.27	1.00, 1.13	
	Mean ± SD	1.01 ± 0.04	1.03 ± 0.05	
TSH	Median, (IQR)	1.76, (0.96, 2.52)	1.98, (1.17, 4.44)	0.5
	Range	0.38, 9.96	0.77, 5.17	
	Mean ± SD	2.07 ± 1.74	2.68 ± 2.00	
	History of Surgery	19 (33.93%)	0 (0.00%)	0.2
	1n (%)			
2Wilcoxon rank sum test; Fisher's exact test				
Serum Potassium	Median, (IQR)	4.45, (4.00, 4.60)	4.30, (4.20, 4.55)	>0.9
	Range	3.40, 5.20	4.00, 4.80	
	Mean ± SD	4.32 ± 0.46	4.37 ± 0.29	
Random Blood Sugar	Median, (IQR)	120.00, (97.00, 153.25)	125.50, (105.75, 140.00)	0.9
	Range	66.00, 357.00	89.00, 148.00	
	Mean ± SD	137.66 ± 57.61	122.00 ± 23.38	
INR	Median, (IQR)	1.00, (1.00, 1.00)	1.00, (1.00, 1.02)	0.5
	Range	1.00, 1.27	1.00, 1.13	
	Mean ± SD	1.01 ± 0.04	1.03 ± 0.05	
TSH	Median, (IQR)	1.76, (0.96, 2.52)	1.98, (1.17, 4.44)	0.5
	Range	0.38, 9.96	0.77, 5.17	
	Mean ± SD	2.07 ± 1.74	2.68 ± 2.00	
	History of Surgery	19 (33.93%)	0 (0.00%)	0.2
1n (%)				
2Wilcoxon rank sum test; Fisher's exact test				

Table 6 shows the comparison of patient parameters as per incidence of post-op complications.

Table 7 shows the univariate regression analysis of various factors.

Table 8 shows the multivariate regression analysis of various factors.

For the multivariate analysis, the value of alpha was adjusted and p-values at or below 0.2 were considered to be significant.

In our analysis, history of previous surgery and moderate risk were found to significantly affect the incidence of intra/post-op complication in cardiac patients undergoing oncosurgeries.

The risk of complications in patients who have undergone previous surgery was 24% more than the patients who have not undergone any previous surgery.

Similarly, patients with moderate risk (as assessed by cardiologist) were 4.64 times more likely to develop complications as compared to patients with mild risk. (CI: 0.61, 46.4; p=0.2). Patients with high risk diagnosed by cardiologist were also 1.90 times more likely to develop complications (CI:0.42,9.16; p=0.12).

## DISCUSSIONS

Goldman et al. reported that 500,000-900,000 Myocardial

Infarctions (MIs) occur annually worldwide with subsequent mortality of 10%-25%. The number of people with coronary artery disease with or without intervention coming for non-cardiac procedures has also increased [6,7].

Large, prospective cohort studies have shown that several chronic cardiac conditions such as coronary artery disease provide a substrate for cardiac complications after surgery [8-11].

Examples of recent preoperative conditions that are independently associated with perioperative cardiac complications are high-risk coronary artery disease (i.e., myocardial infarction or Canadian Cardiovascular Society class (CCSC) III or IV angina within 6 months before surgery), stroke within 3 months before surgery, and coronary-artery stenting within 6 months before surgery [8,12-17].

The incidence of perioperative cardiac complications in our study was 27.41%. Our study revealed history of previous surgery and moderate and high risk as diagnosed by cardiologist as independent risk factors for perioperative cardiac complications.

Table 9 shows the various surgeries studied in our study.

In this study we did not get any correlation between advancing age and incidence of perioperative cardiac complications but previous

**Tab. 6.** The comparison of patient parameters as per incidence of post-op complications.

Characteristic		No, N=51 <sup>1</sup>	Yes, N=11 <sup>1</sup>	p-value <sup>2</sup>
Age	Median, (IQR)	65.00, (58.00, 70.00)	65.00, (56.00, 68.00)	0.4
	Range	43.00, 77.00	38.00, 73.00	
	Mean ± SD	63.75 ± 9.18	60.91 ± 10.26	
Sex	F	24 (47.06%)	5 (45.45%)	>0.9
	M	27 (52.94%)	6 (54.55%)	>0.9
	IHD	43 (84.31%)	9 (81.82%)	>0.9
	Hypertension	30 (58.82%)	7 (63.64%)	>0.9
	Diabetes	20 (39.22%)	7 (63.64%)	0.2
	Stroke	1 (1.96%)	1 (9.09%)	0.3
Weight (kg)	Median, (IQR)	60.00, (52.50, 65.50)	57.00, (52.00, 61.50)	0.6
	Range	35.00, 80.00	41.00, 98.00	
	Mean ± SD	59.45 ± 10.05	59.36 ± 14.95	
ASA Status	I	1 (1.96%)	0 (0.00%)	>0.9
	II	29 (56.86%)	7 (63.64%)	
	III	21 (41.18%)	4 (36.36%)	
Hemoglobin	Median, (IQR)	12.10, (11.15, 13.70)	11.20, (9.75, 12.85)	0.2
	Range	8.10, 17.60	8.20, 15.80	
	Mean ± SD	12.29 ± 1.89	11.53 ± 2.30	
Total Leucocyte Count	Median, (IQR)	8,100.00, (6,700.00, 9,550.00)	8,900.00, (6,150.00, 10,950.00)	0.6
	Range	4,000.00, 15,100.00	4,700.00, 25,200.00	
	Mean ± SD	8,507.84 ± 2,461.53	9,972.73 ± 5,621.23	
Platelet Count	Median, (IQR)	268,000.00, (236,500.00, 338,000.00)	236,000.00, (198,000.00, 263,000.00)	0.035
	Range	128,000.00, 501,000.00	179,000.00, 281,000.00	
	Mean ± SD	280,745.10 ± 84,597.60	229,545.45 ± 38,471.71	
BUN	Median, (IQR)	22.00, (17.50, 28.50)	19.00, (15.00, 29.00)	0.5
	Range	8.00, 71.00	13.00, 41.00	
	Mean ± SD	24.16 ± 11.04	22.36 ± 9.57	
Creatinine	Median, (IQR)	0.90, (0.75, 1.00)	0.90, (0.80, 1.00)	>0.9
	Range	0.50, 1.90	0.40, 8.00	
	Mean ± SD	0.93 ± 0.30	1.46 ± 2.18	
Serum Sodium	Median, (IQR)	136.00, (133.00, 139.00)	136.00, (134.00, 139.00)	0.7
	Range	126.00, 144.00	131.00, 140.00	
	Mean ± SD	135.86 ± 4.04	136.27 ± 3.10	
Serum Potassium	Median, (IQR)	4.40, (4.00, 4.60)	4.50, (4.35, 4.75)	0.082
	Range	3.40, 5.20	4.00, 5.00	
	Mean ± SD	4.27 ± 0.46	4.55 ± 0.32	
Random Blood Sugar	Median, (IQR)	120.00, (98.50, 147.50)	121.00, (94.50, 168.00)	>0.9
	Range	70.00, 357.00	66.00, 194.00	
	Mean ± SD	137.53 ± 57.84	129.73 ± 43.37	
INR	Median, (IQR)	1.00, (1.00, 1.00)	1.00, (1.00, 1.01)	0.7
	Range	1.00, 1.27	1.00, 1.04	
	Mean ± SD	1.01 ± 0.04	1.01 ± 0.01	
TSH	Median, (IQR)	1.72, (0.97, 2.66)	2.02, (0.92, 2.17)	0.5
	Range	0.38, 9.96	0.50, 3.09	
	Mean ± SD	2.23 ± 1.89	1.65 ± 0.84	
	History of Surgery	17 (33.33%)	2 (18.18%)	0.5
1n (%)				
2Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test				

**Tab. 7.** Shows the univariate regression analysis of various factors

Characteristic		N	OR <sup>1</sup>	95% CI <sup>1</sup>	p-value
Sex	Age	62	1	0.93, 1.05	0.6
	F	62	—	—	
	M	62	1	0.32, 3.06	>0.9
IHD	No	62	—	—	
	Yes	62	0.9	0.21, 4.41	0.8
History of Surgery	No	62	—	—	
	Yes	62	0.2	0.03, 0.91	0.062
LV changes	Absent	62	—	—	
	Present	62	1	0.30, 2.96	>0.9
Stenosis	Absent	62	—	—	
	Present	62	0		>0.9
ECG changes	Absent	62	—	—	
	Present	62	0.7	0.23, 2.19	0.6
Regurgitation	Absent	62	—	—	
	Present	62	0		>0.9
1OR=Odds Ratio, CI=Confidence Interval		62			

**Tab. 8.** Multivariate regression analysis of various factors.

Characteristic		OR	95%CI	p-value
Age		0.97	0.89, 1.05	0.5
Sex	F	—	—	
	M	0.74	0.16, 3.21	0.7
IHD	No	—	—	
	Yes	0.33	0.03, 2.72	0.3
History of Surgery	No	—	—	
	Yes	0.23	0.03, 1.23	0.11
LV changes	Absent	—	—	
	Present	0.84	0.20, 3.60	0.8
Stenosis	Absent	—	—	
	Present	0		>0.9
ECG changes	Absent	—	—	
	Present	0.53	0.11, 2.33	0.4
Regurgitation	Absent	—	—	
	Present	0		>0.9
Risk of Surgery	MILD RISK	—	—	
	MODERATE RISK	4.64	0.61, 46.4	0.2
	STANDARD RISK	0		>0.9
	HIGH RISK	1.9	0.42, 9.16	0.12
	1 OR=Odds Ratio, CI=Confidence Interval			

**Tab. 9.** The various surgeries studied in our study.

Type of surgery	No. of cases
Endometrium and ovary	10
Head and neck	25
Breast	14
Bladder and RCC	3
Colon and Rectum	9
Pheochromocytoma	1
Stomach	8
Total	70

studies have shown advancing age as independent risk factor for postoperative complications. In a prospective large-scale study, CAD history and age  $\geq 75$  were both independent predictors of MI in non-cardiac surgery, with 10.3% and 23.5% population attribute risk, respectively [18].

We also found that moderate and high risk as diagnosed by cardiologist was also associated with increased incidence of intraoperative and postoperative cardiac complications.

Several related chronic conditions like cerebrovascular disease, diabetes mellitus, and renal dysfunction and other risk factors in the general population were not independent predictors of PCCs in this study [19,20].

The main limitation of our study is the relatively small number of patients. As a retrospective study, some preoperative information was unavailable including cTnI levels, and we could not comment on the role of preoperative medical management in modifying the risk of PCCs [21].

Postoperative troponin was tested only if clinical or ECG evidence of PCCs, which might lead to a missed diagnosis of silent MI. Moreover, asymptomatic silent troponin level elevation alone is strongly associated with mortality [22].

More prospective studies should be designed to evaluate the risk factors and prophylactic cardiac interventions, and make comprehensive predictive stratification models that allow for better preoperative optimization as to minimize PCCs.

## CONCLUSION

The incidence of perioperative cardiac complications is high

in patients having history of heart disease. This risk is further increased in patients who have history of previous surgery and those diagnosed as moderate and high risk for surgery by cardiologist. So, special precautions should be taken in these patients to avoid complications both intraoperatively and postoperatively.

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## CONFLICTS OF INTEREST

There are no conflicts of interest



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