

DETERMINANTS OF ACCESS AND RECOVERY: A CROSS-SECTIONAL STUDY ON CARDIOTHORACIC SURGERY AMONG OLDER ADULTS IN PAKISTAN

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Abstract

Background: Cardiovascular disease, more common among old people, represents a significant burden in low and middle-income countries like Pakistan, where surgical interventions and quality healthcare access are limited. Therefore, the study aims to determine the prevalence of cardiothoracic surgery along with associated and predictive factors. **Method:** The study was conducted at the Punjab Institute of Cardiology (PIC), Lahore, Pakistan. It employs a cross-sectional study design. A sample of 300 elderly individuals was recruited to collect data through a structured, closed-ended questionnaire in July 2025, using a consecutive sampling technique with different sections. Chi-square and binary regression analysis were used to assess the predictors of cardiothoracic surgery and improved quality of life. **Results** The study results revealed that a major percentage (77%) of the older population had cardiovascular diseases. Further, Chi-square and binary regression analysis revealed that both financial difficulty (AOR:25.85) and heart failure (AOR: 2.327) emerged as strong predictors. For QOL, diabetes, lung disease history, and hypertension show significant association in chi-square, which further confirms them as strong predictors in binary regression analysis, with hypertension having an AOR of 2.156, diabetes having an AOR of 2.329, and lung disease having an AOR of 2.333 at a 95 percent confidence interval.

Conclusion Clinical severity and socioeconomic vulnerability were both regarded as important factors influencing surgical access and postoperative quality of care. Additionally, comorbidities like diabetes, hypertension, and lung diseases were found to negatively impact the quality of life. Integrated financial support mechanisms and preoperative surgical management interventions are required for improved impact of surgical intervention techniques.

INTRODUCTION

Cardiovascular diseases (CVDs), still considered an important public health issue, are the most common

cause of morbidity and mortality all over the globe, particularly among the older population. The older

population is considered the age group who are disproportionately impacted by heart, lung, and thoracic disorders that require surgical procedures to be treated. As, WHO report mentions that about 17.9 million deaths are attributed to CVDs globally, with a higher prevalence found in the older population (1). However, with advances in surgical technology, the expansion of specialized cardiac care, and the growth of specialized services, the aging population is being referred to cardiothoracic surgery more often. A UK-based national audit reveals that more than 227,000 cardiac surgeries were performed in ≥ 70 years or older patients and by the end of the study, it is revealed that it's the ≥ 80 -year-old patients who comprised over 10 percent of adult surgery activity, with a declining hospital death rate observed among these patients (2). Similarly, another Spanish study comparing the 80-87 year olds with the 75-79 year olds age group found that, among the selected patients, quality of life and postoperative medium-term survival were almost identical. This indicates the benefits of advanced surgical intervention for cardiac patients (3).

Older patients also tend to be impacted by comorbidities, including hypertension, lung diseases, diabetes, and clinical frailty, which further trigger the postoperative complications (4-8). A recent meta-analysis mentioned that frailty has been found to increase the risk of morbidity and mortality after cardiac surgeries (9). Similarly, another research confirms that the physical functioning declined after cardiac surgery among older people due to the result of several modifiable clinical factors (10). These morbidities act as risk factors leading to worsening the disease spectrum for the older population.

Cardiac diseases have also been found to be increasing in low and middle-income countries due to the result of epidemiological transition from communicable and non-communicable diseases. As the recent study mentioned, the age-standardized incidence of CVD in Pakistan is 918/100,000, with the age-standardized mortality rate of approx. 358/100,00, showing significantly higher rates (11). Surgery has also been considered as most crucial intervention in national health systems, yet approximately five billion people did not get safe and timely access to the required surgical care (12). Most of the low-income countries, including Pakistan, however, have limited access to cardiothoracic surgeries due to poor healthcare

infrastructure, constrained resources, low public awareness, and affordability issues (12,13). It is also represented in another literature study, which indicates that about 75 percent of the entire world population does not have access to the required cardiac surgical intervention (12). One of Pakistan's household survey data reveals a major gap in access to critical surgical services, especially in rural areas, with financial barriers and referral delay most commonly reported (14).

Operative mortality rates have improved greatly; however, the focus has shifted towards post-operative care, complications, rehabilitation, and quality of life (15-17). For instance, a Japanese cohort study found that the majority of patients who had undergone cardiac and thoracic aortic surgery had improved quality of life (17). Several strategies, such as technological intervention (mobile health application) and targeted recovery protocols, are under investigation that can act as vehicles for the mitigation of rehabilitation difficulty with further enhancement of functional results, although with limited implementation in LMICs (18). In Pakistan, another retrospective study indicates a rising trend of cardiothoracic procedures with increasing percentages of the older population and the overall mortality rate of 4.8 percent during that period (19). Yet another local study from Peshawar examined patients with valvular heart surgery and identified that about 23 percent had concomitant severe coronary diseases and hypertension as comorbidities (20). Despite these, there is limited evidence that especially focuses on the aged population of 60 years or above, barriers to surgery with systematic evaluation of post-operative outcomes, including quality of life in Pakistan. Therefore, this study aims to address the critical gap by exploring the burden, barriers, and outcomes of cardiothoracic surgeries among the older population of Pakistan.

Methodology

Study Design and Settings

A cross-sectional observational study to find the prevalence, barriers, and outcomes of cardiothoracic surgical procedures among the older population of Pakistan was conducted. The study's secondary aims also include investigating the association and predictors of surgery and quality of life. The research

was carried out at the Punjab Institute of Cardiology (PIC), Lahore, Pakistan. This institute was selected because it was considered a high-volume tertiary cardiac care unit having advanced medical and surgical facilities available for cardiac and thoracic illnesses. PIC also has a vast catchment area, especially in outpatient surgery departments (21,22).

Study Population

The study population includes older adults aged 60 years of the Pakistani population at PIC who had cardiothoracic diseases or had undergone cardiothoracic diseases. The respondents who were willing to participate, who could understand the study purpose, were aged ≥ 60 years or above, diagnosed with cardiovascular or lung diseases (or both), and were with or were without a history of cardiothoracic surgery, were included in the study sample. Patients who were too ill to participate or who refused to participate were excluded from the study.

Sample size

The sample size was calculated on the basis of guidelines from logistic analysis. According to these guidelines, it is recommended to have at least 10 events per predictor value to ensure stable estimates (23). Since this study had more than one independent variable (demographic disease, risk factors) and two dependent variables (surgery and QOL), a 300 sample allows sufficient power to detect meaningful results. Additionally, studies using a simple binary analysis approach often consider a sample of 200-300 for balanced statistical efficacy and feasibility in hospital settings (24). Therefore, a chosen sample size allows for the comparison and proper representativeness of a specific population subgroup.

Data Collection

Data were collected in July 2025 at PIC Lahore. Participants were recruited through a Consecutive sampling technique following the pre-defined inclusion criteria. Eligible older adults at PIC inpatient wards, who had come for follow-up checkups or outdoor clinics, were added until the sample of 300 was reached. A structured pre-tested questionnaire was used for data collection. The first three researchers were included in the data collection process. A questionnaire includes different sections,

including demographic variables, disease history (cardiac and lung disease types), risk factors (diabetes and smoking history), access barriers (financial constraints, risk awareness), surgery history, and post-operative outcomes variables were included. The questionnaire was prepared through an extensive literature search. Researchers themselves explain the study purpose, read and fill the questionnaire for respondents, for ease of understanding for the older population.

Dependent and Independent Variables

Surgery status (whether the respondent had undergone cardiothoracic surgery) had two categories: "yes and no", and quality of life variable (whether the participant perceives improved quality of life) had categories, "Improved" and "Not improved", were taken as dependent variables. All other variables were regarded as independent, whose impact had been analyzed in relation to these variables.

Data Analysis

Data was entered in Excel, cleaned and managed, and then exported to a SPSS sheet. Variables were coded in Excel and exported to a SPSS sheet. Continuous variables such as age were categorized and coded accordingly. Data were analyzed using SPSS version 26. A descriptive analysis was found. All variables were categorical, so frequency and percentages were calculated and presented. Then, a chi-square test with a 95 percent significance level and a 5 percent confidence interval was applied to inferential statistics to check the association between the surgical intervention and other demographic as well as disease history patterns. The variables that showed a statistically significant association in chi-square analysis were subjected to a binary logistic regression test to assess the predictors for surgery. For QOL, chi-square analysis was performed, but with some additional questions that represent the QOL variable. Then, binary regression analysis was performed on significant variables to assess the predictors for QOL.

Results

Descriptive analysis revealed that more than half of the study population were males (54.7%), and a significant portion (31%) belonged to the age group of above 80 years. Education levels vary, with 23%

having no formal education and about 29.7% completing secondary education; the ratio of higher levels is very low compared to no formal education. Financial challenges were common (64.7%), and more than half of the participants lived in urban areas (55.3%). A majority had a history of cardiovascular disease (77%), with hypertension (30.3%), coronary artery disease (36%), heart failure (31.3%), and valvular diseases (31%) prevailing in the older population. Diabetes affected 43% of participants, while smoking was reported by 35.7%. Cardiothoracic Surgeries were observed among 63.3 percent of the population, with CABG (22.6%), pacemaker implantation (21.6%), and thoracic aortic aneurysm repair (20.5%) being the most frequently performed

surgery types. Post-treatment complications show in a considerable percentage of participants, in which stroke was the commonly reported complication, affecting 25.1% of the participants, followed by blood clots in 22%. Respiratory issues (19.4%) and infections (20.4%) were also common, while kidney problems were reported by 13.1%. A majority of participants were able to continue their treatment with medication, with 61.6% reporting current medication use, compared to 38.4% who were not on medication. More than half of the participant (52.1%) stated that their quality of life had improved, while 47.9% said that their quality of Life had not improved yet.

<i>Variables</i>	<i>Frequency (f)</i>	<i>Percentage (%)</i>
Sociodemographic Characteristics		
Gender		
Male	164	54.7
Female	136	45.3
Age		
60-65 Years	48	16.0
Above 65-70	51	17.0
Above 70-75	55	18.0
Above 75-80	52	17.0
Above 80 years	94	31.0
Education		
No formal	69	23.0
Primary	84	28.0
Secondary	89	29.7
Higher Education	58	19.3
Financial Challenges		
Yes	194	64.7
No	106	35.3
Residence		
Urban	166	55.3
Rural	134	44.7
Diseases History		
History of CVDs		
Yes	231	77.0
No	69	23.0
Hypertension		
Yes	91	30.3

No	209	69.7
Coronary artery diseases		
Yes	108	36.0
No	192	64.0
Heart failure		
Yes	94	31.3
No	206	68.7
Valvular diseases		
Yes	93	31.0
No	207	69.0
Arrhythmia		
Yes	84	28.0
No	216	72.0
History of lung diseases		
Yes	58	19.3
No	242	80.7
lung COPD		
Yes	11	3.7
No	289	96.3
Lung Pulmonary Fibrosis		
Yes	23	7.7
No	277	92.3
lung cancer		
Yes	24	8.0
No	276	92.0
Other Risk Factors		
Diabetes		
Yes	129	43.0
no	171	57.0
Smoking		
Yes	107	35.7
No	193	64.3
Cardiac Surgery		
Surgery		
Yes	190	63.3
No	110	36.7
Surgery type		
CABG	43	22.6
Thoracic Aortic Aneurysm Repair	39	20.5
Pacemaker implantation ‘	41	21.6
Heart valve replacement/repair	33	17.4
Lung surgery	34	7.90
Hospital type		
Public	92	48.4
Private	98	51.6

Recovery Process		
Recovery experience		
Good	68	22.7
Moderate	66	20.0
Poor	31	10.3
Excellent	25	8.3
Complication occurs		
Yes	62	32.6
No	128	67.4
Complication type		
Blood clots	42	22.0
Stroke	48	25.1
Respiratory issue	37	19.4
Infections	39	20.4
Kidney problem	25	13.1
On Medication		
Yes	117	61.6
No	73	38.4
General Perception regarding		
Quality of Life		
Not improved	91	47.9
Improved	99	52.1

Association of sociodemographic factors and medical history with Cardiothoracic Surgery

The chi-square test was applied to investigate the association between various factors, including demographic characteristics, disease history, and other risk factors, and the occurrence of surgery. The test results revealed that financial challenges were found to have a statistically significant relation (having p-value of <0.00) with cardiothoracic surgery among the older population. This represents a large number of people unable to have access to surgery due to reason of financial constraints. Additionally, CVD disease type heart failure history was also strongly related to surgery status having a p-

value of 0.014, suggesting patients with heart failure had more chances to undergo cardiothoracic surgery. However, other demographic variables like age (p-value=0.787), gender (p-value=0.608), residence (p-value=0.351), and education level (p-value=0.890) indicate no significant relation with surgery. Similarly, the majority of cardiovascular diseases (coronary artery diseases, valvular diseases, and others) and other risk factors indicate statistically insignificant results with a p-value greater than 0.05. Therefore, financial accessibility and certain clinical markers, such as heart failure, were regarded as the most important factors driving surgical utilization among older adults.

Cardiac Surgery					
Yes			No		p-value
	f	%	f	%	
Age (n=300)					
60-65 years	32	16.8	16	14.5	0.787
Above 65-70 years	34	17.9	17	15.5	

Above 70-75 years	37	19.5	18	16.4	
Above 75-80 years	31	16.3	21	19.1	
Above 80 years	56	29.5	38	34.5	
Gender (n=300)					
Male	106	55.8	58	52.7	0.608
Female	84	44.2	52	47.3	
Residence (n=300)					
Urban	109	57.4	57	51.8	0.351
Rural	81	42.6	53	48.2	
Are you facing financial challenges regarding disease treatment and the surgery procedure? (n=300)					
Yes	89	46.8	105	95.5	0.000
No	101	53.2	5	4.5	
Education (n=300)					
No Formal Education	42	22.1	27	24.5	0.890
Primary Education	56	29.5	28	26.5	
Secondary Education	56	29.5	33	30	
Higher Education	36	18.9	22	20	
History of CVD (n=300)					
Yes	145	76.3	86	78.2	0.711
No	45	23.7	24	21.8	
CVD type; Hypertension (n=300)					
Yes	61	32.1	30	27.3	0.380
No	129	67.9	80	72.7	
CVD type; Coronary Artery Diseases (n=300)					
Yes	74	38.9	34	30.9	0.162
No	116	61.1	76	69.1	
CVD type; Heart Failure (n=300)					
Yes	50	26.3	44	40	0.014
No	140	73.7	66	60	
CVD type; Valvular Diseases (n=300)					
Yes	53	27.9	40	36.4	0.126
No	137	72.1	70	63.6	
CVD type; Arrhythmia (n=300)					
Yes	52	27.4	32	29.1	0.749
No	138	72.6	78	70.9	
History of Lung Diseases (n=300)					
Yes	37	19.5	21	19.1	0.936
No	153	80.5	89	80.9	
Lung Diseases; COPD (n=300)					
Yes	6	3.2	5	4.5	0.538
No	184	96.8	105	95.5	
Lung Diseases; Pulmonary Fibrosis (n=300)					
Yes	14	7.4	9	8.2	0.799

No	176	92.6	101	91.8	
Lung Diseases; Lung Cancer (n=300)					
Yes	17	8.9	7	6.4	0.427
No	173	91.1	103	93.6	
Diabetes					
Yes	78	41.1	51	46.4	0.371
No	112	58.9	59	53.6	
Smoking					
Yes	60	31.6	47	42.7	0.052
No	130	68.4	63	57.3	

Predictors of Undergoing Cardiothoracic Surgery

Those variables that appear significant in chi-square analysis were subjected to binary regression analysis to predict the true association. Two variables, “heart failure” and “financial constraints,” were analyzed. The results indicate that patients with a history of heart failure were 1.876 times more likely (p-value=0.014) to undergo cardiothoracic surgery as compared to those without heart failure. The relation remains significantly strong even after adjusting for other variables, with an AOR of 2.327 and a p-value of 0.006. Similarly, financial difficulty

was regarded as one of the strongest predictors for deciding whether to undergo surgical intervention or not. The odds ratio reveals that those who had no financial difficulty are 23.831 times more likely to have undergone surgery as compared to those who were facing financial difficulties. This AOR further reveals that those who did not face financial difficulties were 25.858 times more likely to undergo surgery as compared to those who faced financial difficulties. These findings underscore the importance of socio-economic background and clinical severity on access to surgical interventions.

	<i>OR</i>	<i>p value</i>	<i>Lower-Upper</i>	<i>AOR</i>	<i>p value</i>	<i>Lower-Upper</i>
CVD type; Heart Failure (n=300)						
No	1					
Yes	1.867	0.014	1.132-3.077	2.327	0.006	1.277-4.242
Are you facing financial challenges regarding disease treatment and the surgery procedure? (n=300)						
Yes	1					
No	23.831	0.000	9.297-61.088	25.858	0.000	9.956-67.159

Association of demographic, clinical, and surgical factors with post-operative quality of care

Chi-square analysis for assessing the association between different demographic, clinical, and surgical factors with self-reported postoperative quality of life was performed. The test results revealed that hypertension (p-value=0.025), history of lung diseases (p-value=0.036), and diabetes mellitus (p-value=0.014) were found significantly associated with quality of life outcomes. However, the history of cardiovascular diseases indicates a borderline association with having

p-value of 0.063 with the quality of life outcome. All other variables, including gender, age, financial issues, education, and others, show an insignificant association with other QOL outcomes. This highlights the negative impact of specific comorbid conditions, such as diabetes, on postoperative quality of life outcomes, requiring a holistic approach for chronic disease management.

	Quality of Life				
	Improved		Not Improved		p-value
	f	%	f	%	
Age (n=300)					
60-65 years	15	16.5	17	17.2	0.929
Above 65-70 years	15	16.5	19	19.2	
Above 70-75 years	17	18.7	20	20.2	
Above 75-80 years	17	18.7	14	14.1	
Above 80 years	27	29.7	29	29.3	
Gender (n=300)					
Male	47	51.6	59	59.6	0.270
Female	44	48.4	40	40.4	
Residence (n=300)					
Urban	51	56	58	58.6	0.723
Rural	40	44	41	41.4	
Are you facing financial challenges regarding disease treatment and surgical procedures? (n=300)					
Yes	39	42.9	50	50.5	0.291
No	52	57.1	49	49.5	
Education (n=300)					
No Formal Education	23	25.3	19	19.2	0.722
Primary Education	25	27.5	31	31.3	
Secondary Education	25	27.5	31	31.3	
Higher Education	18	19.8	18	18.2	
History of CVD (n=300)					
Yes	64	70.3	81	81.8	0.063
No	27	29.7	18	18.2	
CVD type; Hypertension (n=300)					
Yes	22	24.2	39	39.4	0.025
No	69	75.8	60	60.6	
CVD type; Coronary Artery Diseases (n=300)					
Yes	35	38.5	39	39.4	0.895
No	56	61.5	60	60.6	
CVD type; Heart Failure (n=300)					
Yes	26	28.6	24	24.2	0.498
No	65	71.4	75	75.8	
CVD type; Valvular Diseases (n=300)					
Yes	26	28.6	27	27.3	0.842
No	65	71.4	72	72.7	
CVD type; Arrhythmia (n=300)					
Yes	24	26.4	28	28.3	0.768
No	67	73.6	71	71.7	
History of Lung Diseases (n=300)					
Yes	12	13.2	25	25.3	0.036

No	79	86.8	74	74.7	
Lung Diseases; COPD (n=300)					
Yes	1	1.1	5	5.1	0.120
No	90	98.9	94	94.9	
Lung Diseases; Pulmonary Fibrosis (n=300)					
Yes	5	5.5	9	9.1	0.343
No	86	94.5	90	90.9	
Lung Diseases; Lung Cancer (n=300)					
Yes	6	6.6	11	11.1	0.276
No	85	93.4	88	88.9	
Diabetes (n=300)					
Yes	29	31.9	49	49.5	0.014
No	62	68.1	50	50.5	
Smoking (n=300)					
Yes	29	31.9	31	31.3	0.934
No	62	68.1	68	68.7	
Surgery type (n=190)					
CABG	21	23.1	22	22.2	0.462
Thoracic aortic aneurysm repair	21	22	19	19.2	
Pacemaker implantation	22	24.2	19	19.2	
Heart valve replacement/repair	11	12.1	22	22.2	
Lung surgery	17	18.7	17	17.2	
Hospital Type for Surgery (n=190)					
Public	46	50.5	46	46.5	0.574
Private	45	49.5	53	53.5	
Recovery Experience (n=190)					
Poor	14	15.4	17	17.2	0.739
Moderate	33	36.3	33	33.3	
Good	30	33	38	38.4	
Excellent	14	15.4	11	11.1	
Complications Occurs (n=190)					
Yes	27	29.7	35	35.4	0.404
No	64	70.3	64	64.6	
Complication types (n=190)					
Blood Clots	23	25.3	19	19.2	0.789
Stroke	24	26.4	24	24.2	
Respiratory issues (n=190)					
Infections	16	17.6	21	21.1	
Kidney Problems	16	17.6	22	22.2	
On medications	12	13.2	13	13.1	
Yes	56	61.5	61	61.6	0.991
No	35	38.5	38	38.4	

Predictors of Postoperative quality of care

Further, binary logistic regression analysis revealed that older patients without hypertension, without diabetes, and without lung diseases are more likely to report better postoperative quality of life outcomes. Patients with the absence of hypertension were about 2 times more likely to report improved quality of life outcomes as compared to those who had

hypertension. While those who have no history of lung diseases had an odds ratio of 2.224 with a p-value of 0.039, and those having no diabetes showed an odds ratio of 2.095 with a p-value of 0.014. All three variables exhibit a strong association, even after adjusting for variables that show statistically significant findings.

	<i>OR</i>	<i>p value</i>	<i>Lower-Upper</i>	<i>AOR</i>	<i>p value</i>	<i>Lower-Upper</i>
CVD type; Hypertension (n=300)						
Yes	1					
No	2.039	0.026	1.089-3.815	2.156	0.021	1.124-4.138
History of lung diseases (n=300)						
Yes	1					
No	2.224	0.039	1.042-4.745	2.333	0.035	1.061-5.132
Diabetes (n=300)						
Yes	1					
No	2.095	0.014	1.160-3.785	2.329	0.007	1.259-4.308

Discussion

Cardiothoracic issues are found to be prevalent among the older population as per study results and are regarded as a growing public health issue, especially in low-middle-income countries (LMICs) like Pakistan, where surgical access and care are routinely limited by socioeconomic disparities and clinical severity. This study identifies key predictors for receiving, accessing surgery, and postoperative QOL improvements. The findings of this study are in accordance with global evidence and also highlight unique context-specific barriers faced by the aging population.

Financial challenges are found to greatly influence the surgery access for cardiothoracic issues. The results of the add ratio reveal that older patients who do not face financial issues are about 25 times more likely to access surgery interventions as compared to those who are facing financial constraints regarding treatment and surgery access. Evidence from the literature correlates with these findings. A recent study conducted in the US highlights the fact that low household income was associated with worse outcomes, with poor access to elective cardiac surgery (25). Similarly, another African study mentioned that financial constraints act as a barrier to access to needed surgical intervention services. This results in increased mortality and morbidity rates of cardiac

failure type illnesses (26). A few Pakistan-based studies are also related to the study results. A nationally representative study found a substantial financial burden that many patients bear, who paid for surgical and related needs (27). Likewise, another study for LMICs mentioned that cardiac patients mostly have to rely on out-of-pocket costs or other charitable sources for cardiac surgery (28). This represents the targeted interventions needed for people facing financial constraints.

Study findings reveal that a severe clinical condition like heart failure significantly increased the chances of cardiothoracic surgery. As odds ratio analysis reveals that patients with a history of heart failure were about 2 times more likely to be operated upon as compared to those who had no heart failure. Studies of LMICs correlate with this finding. As one of the comprehensive reviews conducted in Asia highlights the fact that disease severity influences treatment choices and outcomes (29). Similarly, another review mentions several surgical treatment options (transplantation, mechanical circulatory support, etc) for heart failure, indicating the increased heart failure rate leads to increased cardiac surgical interventions (30).

Absence of hypertension, absence of diabetes, and absence of lung diseases were regarded as positive predictors of improved quality of life. These results

align with the findings of other studies as well. Many studies, however, relate hypertension to a mortality risk factor; few have linked it to quality of life. A recent study conducted in Saudi Arabia on the quality of life and long-term outcomes after cardiac surgery found that comorbidities like hypertension negatively impact patients' long-term QOL in procedures of cardiac surgery procedures (31). Pulmonary disabilities were also found to worsen the postoperative outcomes, negatively impacting the quality of life (32,33), as suggested by the odds ratio analysis of results. Diabetes was also found to have worsened health outcomes, thus impacting the QOL negatively, as represented in the study results. Various studies mention that diabetes worsens surgical outcomes due to increasing surgical site infections, poor healing, and thus delaying the recovery process (34). Our study's odds ratio (2.329) patterns also align with global perspective data, which highlights that diabetes is significantly associated with longer hospital stays and worse QOL outcomes (35).

Some of our variables include age, gender, residence, hospital type, many CVD and lung disease types, and medication did not show any significant association. This reveals that after controlling for severe clinical conditions and comorbidities, demographic variables often lose significance. Study finding reveals several key insights in terms of surgical intervention and quality of life outcomes. Still, the study had some limitations. Firstly, the QOL variable was self-reported and may have been influenced by psychological and social factors that are not captured in our data. Secondly, the study involves a cross-sectional design, which gathers a snapshot of that particular period. Also, the study chose only the people who visit the PIC hospital, leaving several financially and geographically disadvantaged people who had no access to surgery. Therefore, broader-level longitudinal studies that capture vast data are required to gain more understanding of this crucial issue and to target policy-level interventions.

Conclusion

The study underscores the imperative to improve equitable access to resources for cardiothoracic surgery among older adults in Pakistan. Overcoming financial constraints, difficulties, and properly managing comorbidities like diabetes, lung disease,

and hypertension are critical precursors to improved postoperative quality of life outcomes. Therefore, a combination of a focused screening program, supportive healthcare financing, and patient education can assist the assurance that the surgical procedure will have lasting improvement among the older population.

REFERENCES

1. Cardiovascular diseases (CVDs) [Internet]. [cited 2025 Sept 14]. Available from: <https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-cvds>
2. Jones JM, Loubani M, Grant SW, Goodwin AT, Trivedi U, Kendall S, et al. Cardiac surgery in older patients: hospital outcomes during a 15-year period from a complete national series. *Interact Cardiovasc Thorac Surg*. 2021 Nov 11;34(4):532–9.
3. Cardiac Surgery in the Elderly: Comparison of Medium-Term Clinical Outcomes in Octogenarians and the Elderly From 75 to 79 Years. *Revista Española de Cardiología (English Edition)*. 2008 June 1;61(6):579–88.
4. Saetang M, Kunapaisai T, Chatmongkolchart S, Yongsata D, Sukitpaneenit K. Association of Frailty with Intraoperative Complications in Older Patients Undergoing Elective Non-Cardiac Surgery. *JCM*. 2025 Jan 17;14(2):593.
5. Uchmanowicz I, Chudiak A, Jankowska-Polańska B, Gobbens R. Hypertension and Frailty Syndrome in Old Age: Current Perspectives. *Card Fail Rev*. 2017 Nov;3(2):102–7.
6. Gjorgievski M, Ristevski B. Postoperative management considerations of the elderly patient undergoing orthopaedic surgery. *Injury*. 2020 May 1;51:S23–7.
7. Parini S, Azzolina D, Massera F, Garlisi C, Papalia E, Baietto G, et al. Comparison of frailty indexes as predictors of clinical outcomes after major thoracic surgery. *J Thorac Dis*. 2024 May;16(5):3192–203.

8. Abd.Ghafar MZA, O'Donovan M, Sezgin D, Moloney E, Rodríguez-Laso Á, Liew A, et al. Frailty and diabetes in older adults: Overview of current controversies and challenges in clinical practice. *Front Clin Diabetes Healthc*. 2022 Aug 19;3:895313.
9. Chandiramani A, Ali JM. Frailty in Cardiac Surgery—Assessment Tools, Impact on Outcomes, and Optimisation Strategies: A Narrative Review. *J Cardiovasc Dev Dis*. 2025 Mar 31;12(4):127.
10. Itagaki A, Saitoh M, Okamura D, Kawamura T, Otsuka S, Tahara M, et al. Factors related to physical functioning decline after cardiac surgery in older patients: A multicenter retrospective study. *Journal of Cardiology*. 2019 Sept 1;74(3):279–83.
11. Samad Z, Hanif B. Cardiovascular Diseases in Pakistan: Imagining a Postpandemic, Postconflict Future. *Circulation*. 2023 Apr 25;147(17):1261–3.
12. Vervoort D, Meuris B, Meyns B, Verbrugghe P. Global cardiac surgery: Access to cardiac surgical care around the world. *The Journal of Thoracic and Cardiovascular Surgery*. 2020 Mar 1;159(3):987-996.e6.
13. Zilla P, Bolman Iii RM, Boateng P, Sliwa K. A glimpse of hope: cardiac surgery in low- and middle-income countries (LMICs). *Cardiovasc Diagn Ther*. 2020 Apr;10(2):336–49.
14. Ashraf MN, Fatima I, Muhammad AA, Albutt K, Pigeolet M, Latif A, et al. Estimating access to surgical care: A community centered national household survey from Pakistan. *PLOS Global Public Health*. 2023 Nov 15;3(11):e0002130.
15. Weiser TG, Gawande A. Excess Surgical Mortality: Strategies for Improving Quality of Care. In: Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. *Essential Surgery: Disease Control Priorities, Third Edition (Volume 1)* [Internet]. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2015 [cited 2025 Sept 14]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK333498/>
16. Downey CL, Bainbridge J, Jayne DG, Meads DM. Impact of in-hospital postoperative complications on quality of life up to 12 months after major abdominal surgery. *Br J Surg*. 2023 June 19;110(9):1206–12.
17. Sato M, Mutai H, Yamamoto S, Tsukakoshi D, Furuhashi K, Ichimura H, et al. Characteristics of longitudinal changes in quality of life and associated factors in patients post cardiac and thoracic aortic surgery: insights from a prospective cohort study. *J Patient Rep Outcomes*. 2024 Sept 26;8:111.
18. Toft BS, Rodkjær LØ, Sørensen L, Saugbjerg MR, Bekker HL, Modrau IS. Feasibility of early digital health rehabilitation after cardiac surgery in the elderly: a qualitative study. *BMC Health Services Research*. 2024 Jan 22;24(1):113.
19. Siddiqui FJ, Sami SA. A decade of cardiothoracic surgery at a tertiary care hospital in Karachi, Pakistan.
20. Ullah H, Ullah A, Jan R, Ayaz S, Ullah I, Masoud M. Frequency of Coronary Artery Disease in Patients Undergoing Valvular Heart Surgery: A Retrospective Observational Study. *Pakistan Heart Journal*. 2024 Mar 30;57(1):52–6.
21. Statistics | PIC [Internet]. [cited 2025 Sept 14]. Available from: <https://pic.punjab.gov.pk/Statistics>
22. Cardiac Surgery Department | PIC [Internet]. [cited 2025 Sept 14]. Available from: <https://pic.punjab.gov.pk/cardiacSurgery>
23. Bujang MA, Sa'at N, Sidik TMITAB, Joo LC. Sample Size Guidelines for Logistic Regression from Observational Studies with Large Population: Emphasis on the Accuracy Between Statistics and Parameters Based on Real Life Clinical Data. *Malays J Med Sci*. 2018 July;25(4):122–30.
24. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. *Gastroenterol Hepatol Bed Bench*. 2013;6(1):14–7.

25. Sakowitz S, Bakhtiyar SS, Mallick S, Verma A, Sanaiha Y, Shemin R, et al. Persistent income-based disparities in clinical outcomes of cardiac surgery across the United States: A contemporary appraisal. *JTCVS Open*. 2024 Aug;20:89–100.
26. Nwalibe C, Effiom VB, Anyinkeng ABS, James MA, Genda EE, Irungu W, et al. Assessment of the financial gaps in cardiothoracic surgery in Africa. *Interdiscip CardioVasc Thorac Surg*. 2025 Jan 1;40(1):ivae228.
27. Samad L, Ashraf MN, Mohammad AA, Fatima I, Fowler Z, Albutt K, et al. Access and Financial Burden for Patients Seeking Essential Surgical Care in Pakistan. *Ann Glob Health*. 88(1):107.
28. American College of Cardiology [Internet]. [cited 2025 Sept 16]. Financing Cardiac Surgery in Low- and Middle-Income Countries. Available from: https://www.acc.org/Latest-in-Cardiology/Articles/2020/11/19/14/33/http%3a%2f%2fwww.acc.org%2fLatest-in-Cardiology%2fArticles%2f2020%2f11%2f19%2f14%2f33%2fFinancing-Cardiac-Surgery-in-Low-and-Middle-Income-Countries%3futm_source%3dchatgpt.com
29. Feng J, Zhang Y, Zhang J. Epidemiology and Burden of Heart Failure in Asia. *JACC: Asia*. 2024 Apr 1;4(4):249–64.
30. Hullin R, Meyer P, Yerly P, Kirsch M. Cardiac Surgery in Advanced Heart Failure. *Journal of Clinical Medicine*. 2022 Jan;11(3):773.
31. Aleid AF, Alhumidhan AM, Almutairi AT, Alshakhs MA, Bakudam WA, Alsloom NS, et al. Assessing the Long-term Outcomes, Quality of Life and cost-effectiveness in Saudi Patients Undergoing Cardiac Surgery for Coronary Artery Disease: A Cross-sectional Study. *Journal of Advanced Trends in Medical Research*. 2024 Mar;1(1):262.
32. Cavallès A, Brinchault-Rabin G, Dixmier A, Goupil F, Gut-Gobert C, Marchand-Adam S, et al. Comorbidities of COPD. *European Respiratory Review*. 2013 Nov 29;22(130):454–75.
33. Corneanu LE, Singeap MS, Mutruc V, Petriș OR, Toma TP, Șorodoc V, et al. The Complex Relationship Between Heart Failure and Chronic Obstructive Pulmonary Disease: A Comprehensive Review. *Journal of Clinical Medicine*. 2025 Jan;14(13):4774.
34. Dogra P, Anastasopoulou C, Jialal I. Diabetic Perioperative Management. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Sept 16]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK540965/>
35. Aleid AF, Alhumidhan AM, Almutairi AT, Alshakhs MA, Bakudam WA, Alsloom NS, et al. Assessing the Long-term Outcomes, Quality of Life and cost-effectiveness in Saudi Patients Undergoing Cardiac Surgery for Coronary Artery Disease: A Cross-sectional Study. *Journal of Advanced Trends in Medical Research*. 2024 Mar;1(1):262.