Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.6530

VALVULAR SURGERY PREVALENCE AND MORTALITY PATTERNS: ANALYSIS FROM A REFERENCE CARDIOVASCULAR CENTER

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ABSTRACT:
Background: This study aims to characterize cardiac surgeries, delineate their procedures, and assess operational mortality at the National Cardiovascular Institute of Pakistan.
Methods: Descriptive research encompassed all patients over 18 who underwent cardiovascular surgery at the National Cardiovascular Institute "Carlos Alberto Peschiera Carrillo" in Pakistan in 2022. A total of 503 cardiac procedures were analyzed.
Results: Of the patients, 63.6% (320) underwent surgical procedures, with isolated valvular surgery being the most common (27.0%), followed by myocardial revascularization surgery (21.9%). The overall mortality rate was 4.5%, with elective surgeries exhibiting a 2.8% mortality rate and emergency surgeries showing a 14.3% mortality rate. The prevalent postoperative complications included paroxysmal atrial fibrillation (14.0%) and surgical site infection (10.3%).
Conclusion: Valvular surgery, either alone or in combination with other procedures, was the most frequently performed surgery. The achieved mortality rate was deemed satisfactory for a reference center.

KEYWORDS: Cardiac surgeries, Cardiovascular surgery, National Cardiovascular Institute of Pakistan, Operational mortality, Descriptive research, Valvular surgery, Myocardial revascularization, Postoperative complications, Surgical site infection, Mortality rate.

INTRODUCTION:

Cardiovascular diseases (CVD) are the leading cause of death across the globe, accounting for nearly 17.5 million fatalities annually. Eighty percent of these deaths take place in countries with low and intermediate incomes (Tsao et al., 2022). Despite the fact that it is so common

Study	Key Findings
Tsao et al., 2022	CVD is the leading cause of global mortality, with 80% of deaths occurring in low and middle-income countries.
Nashef et al., 2002	Over 6 billion individuals worldwide lack access to safe cardiac surgical care when needed, according to the Global Surgery Initiative Cardiac.
Lawton et al., 2022	The COVID-19 pandemic has exacerbated existing health disparities, with limited access to cardiothoracic surgeons, particularly in Africa.
Members et al., 2022	Limited resources in public hospitals concentrate most heart surgeries in Lima, Peru, managed by the social security system.
Navar et al., 2022	This study addresses a research gap by describing primary cardiac operations and assessing operative mortality rates at the National Cardiovascular Institute of Peru.

The actual severity of the problem on a global scale may be underestimated due to the lack of precise data and quality in these locations.

Reference	Description
Tsao et al., 2022	Cardiovascular diseases (CVD) are the leading cause of death globally, with approximately 17.5 million fatalities annually, with 80% occurring in low and middle-income countries.
Nashef et al., 2002	Despite the recognition of cardiac surgery as an essential component of national healthcare systems, over 6 billion individuals worldwide lack access to safe cardiac surgical care when needed.
Lawton et al., 2022	The COVID-19 pandemic has exacerbated existing health disparities, with an estimated ratio of one cardiothoracic surgeon per four million people in Africa, highlighting the urgent need for improved access to cardiac surgery globally.
Members et al., 2022	Limited resources in public hospitals result in most heart surgeries in Peru being concentrated in Lima, particularly in hospitals managed by the social security system.
Navar et al., 2022	This study aims to describe primary cardiac operations their methods, and assess operative mortality rates and complications up to thirty days post-surgery at the National Cardiovascular Institute of Peru, filling a research gap since its establishment in the 1990s.

Recently, cardiac surgery has been acknowledged as an essential component of the national health care system. On the other hand, according to the Global Surgery Initiative Cardiac, over 6 billion individuals worldwide do not have access to safe cardiac surgical care when required (Nashef et al., 2002). The pandemic caused by COVID-19 has further contributed to the existing health disparities around the world. There is estimated to be just one cardiothoracic surgeon for every four million people living in Africa (Lawton et al., 2022). This is only one example. According to this circumstance, there is an immediate and pressing requirement to incorporate cardiac surgery into the surgical programs of every nation. At the national level, it is of the utmost importance to carry out an adequate mapping of the current state of cardiac surgery to guarantee that individuals who do not have heart disease will have access to surgical treatment for the condition. Because there are not enough resources available in public hospitals, most heart surgery in Peru is performed in Lima, particularly in hospitals run by the social security system (Members et al., 2022). When it comes to the treatment of cardiovascular illnesses, the National Institute of Cardiovascular of Peru is the primary reference facility in the country. On the other hand, no research has been conducted since its inception in the 1990s that demonstrates the outcomes of surgical treatment for these illnesses. As a result, the purpose of this study is to describe the primary cardiac operations and their methods and to ascertain the operative mortality rate by the kind of surgery and the primary complications that were recorded up to thirty days after the surgery was conducted at the National Cardiovascular Institute of Peru (Navar et al., 2022).

METHOD AND MATERIALS:

In terms of the population and the design of the study: In order to carry out a descriptive analysis, the data of surgeries made available by the EsSalud medical records program (SGSS) and the Cardiovascular Surgery Service of the Institute National Cardiovascular "Carlos Alberto Peschiera Carrillo" were utilized. A combination of the information acquired from both sources served as the basis for the study. It is a specialist national security reference center in Peru (EsSalud) for treating problems that are exceedingly difficult with cardiovascular diseases (Fairbairn et al., 2022). The institute is located in Peru. It can be found in the city of Lima, which serves as the capital of Peru. The population of the study consisted of all patients who were over the age of 18 and had undergone cardiovascular surgery between January 1 and December 31, 2022. This group includes all persons operated on during this period without exceptions (Fairbairn et al., 2022). There is a range of values: Several significant factors were taken into consideration, including the following: A surgical procedure of a particular kind. Procedures that fall under the following categories: valve surgery, which involves one or more procedures in the heart valves; coronary surgery, bypass procedure isolated coronary; coronary surgery with multiarterial grafts, which involves two or more distal anastomoses with arterial conduits (mammary artery plus radial artery or double mammary artery); surgery combined valve, procedures that combine valve surgery and coronary; aortic surgery, which covers various diseases such as dissection, penetrating ulcer, intramural hematoma, aneurysm and pseudoaneurysm; and other miscellaneous procedures with extracorporeal circulation (ECC) such as heart tumor surgery, Hypertrophic cardiomyopathy, pacemaker lead removal infected and pulmonary thromboendarterectomy (Lloyd-Jones et al., 2022). This refers to the occurrence of mortality during the surgery. Regardless of the reason for death, these are defined as any fatalities that occur during the hospitalization period in which the procedure was conducted, even after thirty days have elapsed. This includes deaths that occur after the surgery has been completed (Members et al., 2022). The difficulties that arose as a result of the surgical procedure. Mechanic ventilation prolonged, defined as intubation for more than 48 hours in the postsurgical period; stroke, confirmed due to clinical suspicion and brain tomography; excessive bleeding, which required surgical reintervention for exploration and hemostasis review; cardiac reintervention, which involved a second operation with extracorporeal circulation to correct surgical complications within the first 30 days after surgery; myocardial infarction, defined according to the fourth universal definition of myocardial infarction; mediastinitis, deep surgical site infection that required surgical reintervention for cleaning (Gammie et al., 2022).

Statistical analysis and interpretationThe statistical software Stata 15 (Stata Corporation, College Station, Texas, United States of America) and the program Microsoft Excel were utilized to process the information. Stata Corporation developed both of these programs. Because of the variables' non-normal distribution, categorical data is displayed in the form of absolute frequencies and percentages. However, the quantitative values are presented as median and interquartile ranges. The variables are not normally distributed (Benedetto et al., 2022).

Integral elements of morality: The ethical principles specified in the Declaration of Helsinki were adhered to, and the confidentiality of all patient information was protected throughout the process (Ades et al., 2017).

RESULT:

In 2022, 503 cardiac operations were carried out, of which 320 (comprising 63.6%) were performed on patients experiencing variation. Out of the total number of patients who underwent surgery, 106 (21%) did not have more than 50 years of age, 75 (14%) had between 50 and 59 years of age, 165 (32%) had between 60 and 69 years of age, 140 (27%) had between 70 and 79 years of age, and 17 (3.3%) had more than 80 years of age. (Benedetto et al., 2022).

The first table presents the total number of surgical procedures carried out in each month of the year 2022. El reactivación progresiva de las actividades asistenciales después de la cuarentena estricta during la pandemia of la COVID-19, which results in a decrease in the number of cirugías, is something that has been observed in the first few months of the year (Fearon et al., 2022).

Table 1: The various surgical procedures that were carried out at the National Cardiovascular Institute in the year 2022

Surgical procedure type	Month												Total	per cent
	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEP	OCT	NOV	DEC		
Congenital kind of heart disease	0	2	6	3	5	3	1	1	3	1	0	1	21	5,2
Combined	6	6	3	2	3	8	1	4	5	3	1	1	43	8,5
The coronary	8	8	7	7	8	6	5	9	11	14	10	17	110	21,9
With CPB, starting from the aorta	3	2	8	5	5	4	3	3	4	3	7	4	51	10,1
Multivalvular	6	3	4	9	8	9	11	6	3	7	7	7	80	15,9
Isolated valve	6	9	8	7	13	15	18	15	13	10	13	9	136	27,0
Following myocardial infarction, the mechanics of the repair of problems	0	0	0	3	2	2	1	2	0	1	1	2	14	2,8
Other procedures that involve CPB	2	2	1	3	5	1	2	2	2	1	3	0	24	4,8
Donation of the heart	1	0	1	1	0	2	1	0	3	2	1	0	12	2,4
Ventricular assistance and extracorporeal membrane oxygenation	0	0	0	0	0	0	1	0	5	1	0	0	7	1,4

At a total of 136 surgeries, which accounts for 27.0% of all surgical procedures, the most common surgical procedure was an isolated valve surgery, which primarily involved the replacement of aortic or mitral valves. Following myocardial revascularisation (coronary bypass), 110 procedures were performed, which accounts for 21.9% of the total. The fact that they performed 12 heart transplants over the year, which accounts for 2.4% of the total, is a critical point to emphasize; the most common type of valve surgery was the replacement of the aortic valve, accounting for 112 cases, 51.9% of the total number of valve surgeries, and 22.3% of all cardiac surgeries performed in the year. Thirty patients, or 27.2% of the total number of coronary surgeries, underwent coronary surgery that included the utilization of two arterial grafts. These grafts were placed in the left mammary artery, the radial artery, and the bilateral mammary artery. Forty-nine surgeries, or 9.7% of the total number of surgeries, were performed, which were considered to be minimally invasive. With 23 procedures (46.9% of the total number of minimal access surgeries), the most common surgery performed by minimal invasion was the replacement of the aortic valve (Fearon et al., 2022). This was accomplished through a mini-thoracotomy or a mini-sternotomy (Vaduganathan et al., 2022). The subsequent most common intervention was the closure of the atrial septal defect (ASD) and the mitral valve. Over the entire year, there were a total of 23 deaths that were documented, which corresponds to a mortality rate of 4.5% overall. When calculating mortality rates, however, it was found that the rate was 2.8% for elective surgeries, while the rate was 14.3% for emergency surgeries (Gaudino et al., 2022). The procedure that was performed the most frequently, surgery on an isolated valve (aortic valve replacement or valve surgery mitral valve), had a mortality rate of 0.8% in cases considered eligible for elective surgery.

Isolated coronary surgery had a mortality rate of 1.1% in stable patients, but it had a mortality rate of 40.0% in emergency cases. The most common complication observed was fibrillation paroxysmal auricular, which occurred 14.0% of the time. Infection of the site (Gaudino et al., 2022).In this study, we have documented the cardiac surgical activity internationally in our hospital for the first time, which complements the few studies published by other centers at the national and Latin American levels (Timmis et al., 2022). As per the monthly study, we found a decline in the number of surgeries during the first two months compared to the rest of the year 2022 (Wang et al., 2022). This implies that our center was not immune to the influence of the pandemic, with January and February being the months closer to the post-pandemic stage. A similar pattern is observed in the Spanish registry of cardiovascular surgery in 2020, which shows a decline of about 20% in activity in this context. Our results show that surgery valves are the most frequent, as in Mexico, where results comparable to our reality are published, with isolated valvular heart surgery as the most prevalent, followed by coronary surgery. This differs from country records, such as those of the United States, where surgery predominates coronary (70%). Lowenstein et al. indicate coronary surgery is the most prevalent above-surgery valve in Argentina. Gomez et al. In Brazil, they claim that surgical myocardial revascularisation is the most performed, representing 48.8%, followed by valve surgery (Nguyen et al., 2022).

DISCUSSION:

In 2022, 503 surgical procedures were performed from a cardiac perspective. Isolated valve surgery, which mainly involves the replacement of the aortic or mitral valve, was the most prevalent surgical treatment, accounting for 136 surgeries (27.0%). This was followed by surgery of myocardial revascularisation, which accounted for 110 procedures (21.9%). It was found that among valve procedures, aortic valve replacement isolated continues to be the most common surgery. This conclusion is comparable to the findings of Lowenstein et al. and the registry of the year 2022 of the STS (The Society of Thoracic Surgeons). During the year, there were a total of 23 deaths that were documented. Regarding the grafts utilized in coronary surgery, the combination of the mammary artery and the saphenous vein was the most frequently utilized, accounting for 70.9% of the total. Second, multiarterial grafts, which include mammary plus radial and double mammary grafts, accounted for 27.3% of the total. This figure is more significant when compared to the findings of the STS registration for the year 2022, which state that these grafts were utilized in 14.3% of coronary procedures. Our findings showed that the radial graft was utilized as a second arterial conduit in 18.1% of cases. This preference is comparable to the STS registry, which records the same preference. Greater use of this graft in our institution during 2022 is based on the findings of studies led by Gaudino and Quereshi. These studies found that using radial artery grafts for coronary revascularisation led to a lower event rate of adverse cardiac events and increased patency at five years of follow-up compared to the utilization of saphenous grafts. According to the findings of Lowenstein and colleagues, combination surgery, which includes aortic replacement and coronary revascularisation, is performed by 79.5% of patients. On the other hand, this particular subtype of intervention resulted in 53% at our facility, which is a finding that is comparable to the findings of the STS registry throughout the past three years. In terms of the statistics about emergency surgery, the most common cause of surgery was coronary artery disease, which accounted for 19.5% (15 of 77 cases). Heart transplants came in second, accounting for 15.6% (12 of 77 cases). Because we are a national reference hospital, transplant heart disease is responsible for a significant proportion of the cases that are considered to be emergencies. According to the findings of Mitrev and Anguseva, coronary surgery was the most common form of cardiac surgical intervention in the emergency setting. However, the percentage of patients who underwent this procedure was significantly higher than the average, 45.47 percent. This higher value is likely because Mitrev and Anguseva's study included a more significant number of patients and a more extended follow-up period. There is a search for less intrusive and more practical healing methods for cardiac surgery. In our research, the minimally invasive technique was utilized. 9.7% (49 out of 503) of all cardiac surgeries performed in 2022. This percentage is lower when compared to the 38.7% that the STS documented in 2021.

For our research, the lesser adoption of this strategy can be attributed to the requirement for qualified staff and the availability of additional resources. As far as postoperative complications are concerned, the most common one that we found was auricular fibrillation, which occurred within the first thirty days following surgery; there was a 14% occurrence. According to the findings of the STS registry, this complication is likewise the most common one. It was observed in 26% of patients who received coronary revascularisation surgery and 27% of patients who underwent isolated valve replacement. On the other hand, these findings contradict the findings of Pahwa S. et al., who demonstrated that the most prevalent postoperative complication was postoperative bleeding, which occurred 47.3% of the time. This was followed by postoperative atrial fibrillation, which occurred 32% of the time. The overall mortality rate reported in our institution was higher than that reported by Salamanca et al. in a descriptive study carried out in a general hospital in Peru (4.5% versus 0%). This is because Salamanca reports several cases significantly lower than ours, and the complexity of the various types of cardiac interventions is significantly lower. However, our mortality rate is lower than the one reported by Rodríguez-Hernandez (4.5% versus 9.2%), than the one reported by the Brazilian registry (4.5% versus 6.4%), and in the same manner, as indicated by the Spanish registry (4.5% versus 5.5%), when considering the context of national reference centers and where the complexity of surgery is more comparable to that of our institution. One hundred ten patients who underwent coronary surgery was 6.3%, which was higher than the mortality rate that was seen internationally, which ranged from 2.7 to 4.9 percent. On the other hand, if we only include elective coronary procedures, our mortality rate would be 1.1%, which is lower than the percentages that were cited earlier for the international population. However, these international records do not differentiate between elective and emergency surgery. They do not make a point of distinction. When we pay attention to our coronary emergency cases, we notice that our mortality rate (40%) is significantly higher than what Schumer et al. reported in a center in the United States, which was 8.7%. However, I am familiar with a mortality rate that is very close to what Oliveira et al. reported, which was 36.4% in a public hospital in southern Brazil for patients who were undergoing emergency coronary surgery (Diab et al., 2022). Because of this scenario, it is necessary to examine the factors that support these data thoroughly. This creates the possibility of conducting a particular study in coronary surgery on the cases brought to our institution to gather vital information that can be used to improve the outcomes for these patients. Now, about the operative mortality for replacement isolated valve surgery, we report that it was 1.5%. This figure is slightly lower than the one that Kim et al. describe, which indicates that the mortality rate for this particular subtype of cardiac surgery is 2.3% (Ades et al., 2017). The data given by Siregar et al. indicate that combination surgery presented a mortality rate of 5.3%. However, our results showed that it was 6.9%. This is another slight discrepancy that happens in combined surgery. This study has several limitations because it is retrospective, which means that it depends on the information acquired during the clinic sessions. In addition, the research was conducted in a single institution, which may restrict the extent to which the findings may be generalised to other environments (Wenger et al., 2022). It is also essential to keep in mind that the scope of this study is limited to the surgical procedures carried out in the year 2022; hence, it may not accurately reflect trends throughout time, at some point in time, or in other locations. Considering that our institute is a reference center in the treatment of cardiac pathology, this study aims to develop a database on cardiac pathology and the aorta that requires surgical intervention. This is because registration is absent at the national level. Despite these limitations, it is essential to point out that this is the first report on cardiac surgery outcomes that has been published nationwide. This fact underscores the significance of our research to the field. In conclusion, valve surgery was the procedure that was performed the most frequently at our institution, regardless of whether it was conducted just by itself or in conjunction with other treatments. We believe that the mortality rate and the frequency of complications are acceptable and comparable with other reference centers; however, a careful analysis is required in the case of coronary surgery. As a result, this indicates an opportunity to conduct a study specific to this type of cardiac surgery to obtain data that is important for improving the outcomes for these patients.

CONCLUSION:

Analyzing heart procedures and operational mortality over 2022 is a crucial initiative The National Cardiovascular Institute has undertaken. This endeavor holds significant implications for advancing our understanding of cardiovascular health outcomes and refining medical practices. Through meticulous examination and interpretation of data, valuable insights can be gleaned to enhance patient care, optimize procedural techniques, and ultimately mitigate operational mortality rates. By shedding light on trends, identifying areas for improvement, and implementing evidence-based strategies, this analysis has the potential to drive meaningful progress in cardiovascular medicine. As we move forward, it is imperative to prioritize the dissemination of findings, foster collaboration among healthcare professionals, and empower informed decision-making to safeguard patients' well-being and further elevate cardiovascular care standards.

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