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Original Research Article

Comorbidities in adult cardiac surgical patients

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ABSTRACT

Background: The objective of this study was to describe the prevalence of comorbidities in adult cardiac surgical patients and their impact on post-operative outcomes.
Methods: This was an observational analysis of patients presenting for cardiac surgery at Queen Alia Heart Institute in the period between September 2023 and January 2024. Patients' demographics, comorbidities, type of surgery (cardiac pathology), intensive care unit and hospital length of stay were analysed. Patients were divided into four groups according to their number of extra cardiac comorbidities: Group 0 with no comorbidities, group 1 with 1 comorbidity, group 2 with 2 comorbidities and group 3 with more than 2 comorbidities. These groups were compared in relation to extubation time, intensive care unit length of stay, hospital stay and mortality.
Results: Data from 152 adult cardiac surgical patients who underwent 159 procedures was analysed. Male patients were 123 (80.9%). Average age of patients was 57 years and 32 patients (21%) were over 65 years. Most common procedure was CABG 130. Most common comorbidities were: hypertension as 113 (74.3%), diabetes 81 (53.26%), obesity 57 (37.5%), smoking history or respiratory disease 106 (69.73%), peripheral vascular disease 5 (3.29%), renal failure 4 (2.63%). The average Euroscore was 5.25%. Majority of patients 59.9% had more than two extra cardiac comorbidities. Time of tracheal extubation increased from 8.2 hours in group 0 to 18.4 hours in group 3. Mortality increased from 0% in group 0 to 12.1% in group 3.
Conclusions: Most of the cardiac surgical patients present with more than two extra cardiac morbidities. As the number of preoperative comorbidities increases; the longer is the duration of postoperative mechanical ventilation and the mortality.

Keywords: Cardiac, Comorbidity, Extubation, Hospital stay, Mortality, Surgery

INTRODUCTION

Cardiac surgery, with its diverse spectrum of procedures, plays a pivotal role in managing cardiovascular diseases.[1] However, the landscape of patients undergoing cardiac surgery is often complicated by the presence of comorbidities.[2] Comorbidities, defined as the coexistence of two or more medical conditions in an individual, add layers of complexity to the perioperative management of these patients.[3] Understanding the influence of comorbidities on cardiac surgery outcomes is crucial for optimizing patient care and improving surgical success. Comorbidities, introduce complexity to the perioperative care of individuals undergoing cardiac procedures.[4] Comorbidities often coexist with cardiovascular diseases, encompassing conditions like diabetes, hypertension, chronic kidney disease, and pulmonary disorders. The presence of these additional health concerns contributes to increased challenges for both patients and the surgical team. Existing literature underscores that comorbidities play a significant role in influencing perioperative morbidity, mortality rates, and overall surgical success.[6] Several medical conditions may increase the risk of cardiac surgery and complicate the postoperative convalescent period such as respiratory disease, peripheral

arterial disease, renal dysfunction, diabetes mellitus, recent myocardial infarction, old age, and left ventricular dysfunction, urgency of surgery, female gender, smoking and obesity. Accurate risk assessment is fundamental in determining the suitability of patients for cardiac surgery. Comorbidities significantly add to the complexity of risk assessment models, necessitating an exploration of specific comorbidity profiles and their implications.[7,8] Understanding how comorbidities interact with established risk factors contributes to more nuanced risk stratification, aiding in preoperative decision-making and planning. First tool for risk scoring for cardiac surgery was introduced at the Montreal Heart Institute in the 1980s.[9] Later on many risk stratification tools (scoring systems for surgical risk) were developed by cardiac surgeons, cardiac anaesthetists and intensivists to calculate an estimated risk of mortality and morbidity which will aid patient counselling and decision making before surgery. Validation of these risk stratification tools and comparisons between their performances is extensively investigated in literature.[10-12]

Although that risk scoring was originally designed to predict perioperative mortality after cardiac surgery its use for prediction intensive care unit length of stay and duration of hospitalization has been tried.[13]

The prevalence of comorbidities in cardiac surgery candidates has been steadily rising, reflecting an aging population and increased survival rates among individuals with chronic diseases.[14]

The aim of the study was to provide a comprehensive review of the impact of various comorbidities on outcomes in cardiac surgery, shedding light on the intricate interplay between pre-existing conditions and surgical results.

METHODS

This was a prospective observational study of cardiac surgical patients presenting at Queen Alia Heart Institute in the period between September 2023 and January 2024. Patients' demographics, comorbidities, type of surgery (cardiac pathology), intensive care unit and hospital length of stay were recorded pre-operatively, intra- and post-operatively on Google forms to be subsequently analysed on Microsoft excel. Operative risk was assessed using The European System for Cardiac Operative Risk Evaluation (EUROSCORE) 2. Patients were divided into four groups according to their number of extra cardiac comorbidities: group 0 with no comorbidities, group 1 with 1 comorbidity, group 2 with 2 comorbidities and group 3 with more than 2 comorbidities. These groups were compared in relation to extubation time, intensive care unit length of stay, hospital stay and mortality.

Ethical committee approval was obtained.

Obesity

A body mass index (BMI) over 30 is obese.

RESULTS

Data from 152 adult cardiac surgical patients with different types of cardiac pathology was analysed. Average age of patients was 57 years (ranged from 23 to 78 years). Male patients were 123 (80.9%) and females were 29 (19.1%). Number of procedures was 159. Most common procedure was CABG 130 (85.5%), AVR 7 (4.6%), MVR 11 (7.2%), Aortic surgery 6 (3.9%), TVR 2 (1.3%), VSD 1 (0.7%), ASD 1 (0.7%), Myxoma 1 (0.7%). Combination of more than one procedure was performed on 7 patients (4.6%).

Most common comorbidities were: hypertension as 113 (74.3%), diabetes 81 (53.26%), smoking history or respiratory disease 106 (69.73%), peripheral vascular disease 5 (3.29%), renal failure 4 (2.63%), anaemia 2 (1.3%) prostate cancer 2 (1.3%), lymphoma 1 (0.66%), Marfan syndrome 1 (0.66%), von Willebrand disease 1 (0.66%). The average EUROSCORE was 5.25% and ranged between 0.62 and 38.51% (Table 1).

Extubation time increased proportionally with the number of comorbidities, as patients with no comorbidities (group 0) were extubated after 8.2 hours from arrival to ICU, while patients with one comorbidity (group 1) were extubated 12.1 hours after ICU arrival, patients with two comorbidities were extubated after 14.6 hours and patients with more than two comorbidities were extubated after 18.4 hours from their arrival to ICU. The length of ICU stay was shortest in patients with no comorbidities (3.4 days) and increased to more than 5 days in patients with comorbidities (group 1, 2 and 3).

Length of hospitalisation was between 12 and 13 days in all groups. Mortality rates significantly increased when patients had more extra cardiac co-morbidities and ranged from 0% in group 0 to 12.1% in group 3.

Table 1: Patients' demographic and clinical characteristics.

Variables	Number (%)
Total number of patients	152
Average age	57
Age over 65 years	33
Males	123 (80.9)
Female	29 (19.1)
Average EUROSCORE	5.25
Hypertensive	113 (74.3)

Continued.

Variables	Number (%)
Diabetic	81 (53.26)
Obesity	57 (37.5)
Peripheral vascular disease	5 (3.29)
Pre-operative renal failure	4 (2.63)
History of smoking or respiratory disease	106 (69.73)
Preoperative anaemia	2 (1.3)
Prostate cancer	2 (1.3)
Lymphoma	1 (0.66)
von Willebrand disease	1 (0.66)
Marfan syndrome	1 (0.66)
Elective surgery	141 (92.8)
Urgent surgery	7 (4.6)
Emergency surgery	4 (2.6)
Coronary surgery	130 (85.5)
Aortic valve surgery	7 (4.6)
Mitral valve surgery	11 (7.2)
Ascending aorta surgery	6 (3.9)
Tricuspid valve surgery	2 (1.3)
Repair of atrial septal defect	1 (0.7)
Repair of ventricular septal defect	1 (0.7)
Myxoma	1 (0.7)

Table 2: Comparison according to the number of co-morbidities.

Variables	Group 0 (no comorbidities) N (%)	Group 1 (1 comorbidity) N (%)	Group 2 (2 comorbidities) N (%)	Group 3 (more than 2 comorbidities) N (%)
Number of patients	6, (3.9)	18, (11.8)	37, (24.3)	91, (59.9)
Extubation time (hours)	8.2	12.1	14.6	18.44
Length of ICU stay (days)	3.4	5.1	5.4	5.1
Length of hospitalisation (days)	12.5	12.3	11.97	13.1
Intra-aortic balloon pump (IABP)	1, (16.7)	2, (11.2)	4, (10.8)	7, (7.8)
Reopening of sternum	1, (16.7)	1, (5.6)	6, (16.2)	16, (17.6)
Mortality	0, (0)%	1, (5.6)	4, (10.8)	11, (12.1)

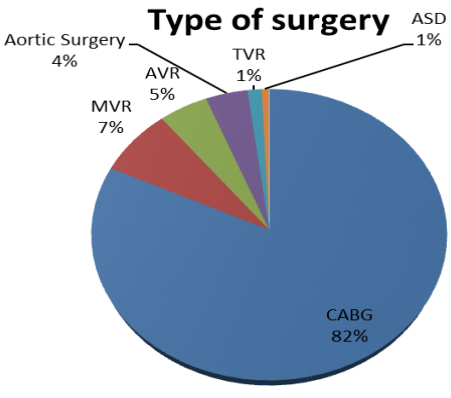

Figure 1: Type of cardiac surgery.

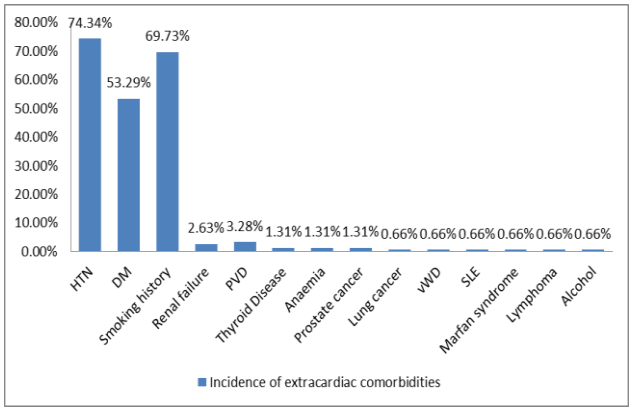

Figure 2: Incidence of extra cardiac comorbidities.

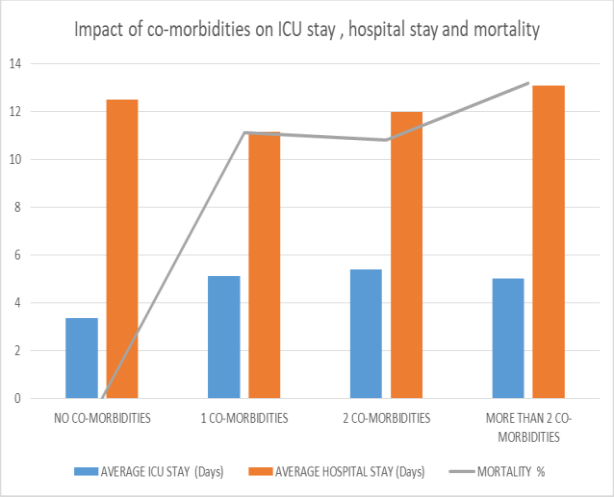

Figure 3: Impact of co-morbidities on ICU stay, hospital stay and mortality.

DISCUSSION

Pre-operative risk assessment is mandatory to optimise patients pre-operatively, provide patients with full information about the risk of surgery, to adapt the surgical strategy and to improve outcome from cardiac surgery. It includes two widely used scores (Society of thoracic surgeons and EUROSCORE II). In our analysis the EUROSCORE II ranged from 0.62% and 38.51% (average 5.25%); which indicates the diversity in clinical status of adult cardiac surgical patients at the time of their presentation for surgery. In our analysis we studied the impact of extra cardiac comorbidities on the outcome of cardiac surgery.

One of the factors taken into consideration in the above mentioned risk scoring systems is age. As the population ages, increasing numbers of older people are presenting for cardiac surgical interventions. This group is at higher risk because of frailty and extra-cardiac medical conditions. The average age and risk profile of patients undergoing cardiac surgery are steadily increasing and present new sets of challenges to anaesthetic, medical and surgical care. However, age is a not a modifiable risk factor for cardiac surgery. In our analysis 21% of patients were over 65 years. Many of the non-modifiable factors such age, sex, race, prior myocardial infarction, previous cardiac surgery and emergency surgery are well-known risk factors contributing to adverse outcomes; however, they cannot be altered. On the other hand, other risk factors such as obesity, diabetes and smoking can be modified to improve the outcome after cardiac surgeries.[15] The most common comorbidities in our analysis were hypertension (74.3%), smoking and respiratory disease (69.7%), diabetes (53.3%) and obesity (37.5%). However, the majority of patients (59.9%) had more than two extra cardiac comorbidities. (Table 1).

We decided to study the impact of the number of extra cardiac comorbidities on the outcome of cardiac surgery by dividing the patients into four groups according to the number of their comorbidities. Group 0 is the group with no other disease than the cardiac, group 1 are those with only one extra-cardiac co-morbidity, group 2 with two extra cardiac medical conditions and group 3 are the multi-morbid patients with more than two extra cardiac illnesses. We compared these groups according to time of tracheal extubation from ICU arrival, length of ICU stay, incidence of reopening, length of hospitalisation and mortality. As shown in Table 2, the majority of adult cardiac surgical patients are multi-morbid (59.9%). It was noticed that duration of postoperative mechanical ventilation increased in correlation to the number of comorbidities from an average of 8.2 hours in group 0 (with no extra cardiac comorbidities) to 18.4 hours in group 3 (with more than two comorbidities). The length of ICU stay and hospitalisation time also increased, albeit to a lesser extent. Mortality increased dramatically with the number of comorbidities patients are having from 0% in group 0 to 12.1% in group 3. This should bring more attention to altering the modifiable risk factors especially before an elective cardiac surgery.

Limitations of this study are the observational nature of the study, the limited number of patients and that it is a single centre study.

CONCLUSION

Most of the cardiac surgical patients had more than two extra cardiac morbidities at the time of surgery. As the number of pre-operative comorbidities increases; the longer is the duration of post-operative mechanical ventilation and the mortality. Management of modifiable comorbidities and risk factors before surgery can improve outcome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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