

ORIGINAL RESEARCH

Estimation of risk factors in cardiac surgical patients

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ABSTRACT

Background: In order to address a variety of cardiovascular disorders, cardiac operations—also referred to as cardiac surgeries or procedures—involve making changes to the heart or major arteries. This study was conducted to assess risk factors in cardiac surgical adult patients. **Materials & Methods:** 94 adult patients selected for cardiac surgery under cardiopulmonary bypass of both genders were selected. Clinical profile, systolic and diastolic blood pressure, preoperative status, type of surgery, risk factors, and other parameters were documented. **Results:** There were 62 males and 48 females. Age groups 20-30 years had 5, 30-40 years had 25, 40-50 years had 52 and 50-60 years had 28 patients. BMI showed healthy 14, overweight 36, obese 40 and severe obese 20 subjects. Preoperative conditions were neurological disorders in 9, AIDS in 2, immunosuppression in 5 and neoplasm in 1. Conditions found were diabetes in 23, hypertension in 14, extracardiac arteriopathy in 6, intermittent claudication in 8, chronic renal insufficiency in 5 and chronic pulmonary disease in 2 patients. Operations performed were elective surgery in 60, aortic valve surgery in 28, mitral repair or replacement in 12 and heart transplant in 10 patients. The difference was significant ($P < 0.05$). Out of 110 patients, 7 (6.3%) died. Common risk factors were advancing age, female gender, extracardiac arteriopathy, chronic pulmonary disease, neurological dysfunction, serum creatinine >200 , LVEF 30-50%, LVEF $<30\%$ and systolic pulmonary pressure > 60 . **Conclusion:** Systolic pulmonary pressure > 60 , advancing age, female gender, extracardiac arteriopathy, chronic pulmonary disease, neurological dysfunction, serum creatinine >200 , LVEF 30-50%, and LVEF $<30\%$ are some of the risk factors that lead to cardiac surgical death. This information can be used to develop a risk stratification approach for assessing the quality of care and estimating hospital mortality.

Keywords: aortic valve surgery, cardiac surgeries, chronic pulmonary disease

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INTRODUCTION

In order to address a variety of cardiovascular disorders, cardiac operations—also referred to as cardiac surgeries or procedures—involve making changes to the heart or major arteries. These operations, which can range from very simple procedures to intricate surgery, are carried out by heart surgeons.¹ Thanks to improvements in surgical methods and related technologies, more and more people can now have heart surgery. Crude fatality rates are often used as a proxy for quality of care, but their use is limited when patient risk profile data is not available. It is unclear what the current risk profile of people having heart surgery is.^{2,3}

A surgical treatment called coronary artery bypass grafting (CABG) is performed to treat coronary artery disease (CAD), a condition in which the coronary arteries that supply the heart muscle are constricted or obstructed. Crude mortality may be adequate for

gauging the quality of care, according to others, since it also reflects the wisdom of careful patient selection.⁴ The risk paradox, which has been shown to be particularly noticeable in high-risk patients when it comes to the relative advantage of surgery over medical therapy, makes this untrue in the context of cardiac surgery.⁵ Furthermore, others argue that operative mortality is not the only important outcome indicator and that patients who survive cardiac procedures may nevertheless experience high morbidity and a poor long-term outcome.⁶ This study was conducted to assess risk factors in cardiac surgical adult patients.

MATERIALS & METHODS

This study comprised of 94 adult patients selected for cardiac surgery under cardiopulmonary bypass of both genders. A written patients' consent was obtained before starting the study.

Data such as name, age, etc. was recorded. Clinical profile, systolic and diastolic blood pressure, preoperative status, type of surgery, risk factors, and other parameters were documented. The results were compiled and subjected to statistical analysis. P value less than 0.05 was regarded as significant.

RESULTS

Table I Distribution of patients

Age group (years)	Male	Female	P value
20-30	6	3	0.05
30-40	10	7	
40-50	28	15	
50-60	14	11	
Total	58	36	

Table I shows that there were 58 males and 36 females. Males and females in age groups 20-30 years had 6 and 3, 30-40 years had 10 and 7, 40-50 years had 28 and 15 and 50-60 years had 14 and 11 patients. The difference was significant ($P < 0.05$).

Table II Patients characteristics

Parameters	Variables	Number	P value
BMI	Healthy	17	0.05
	Overweight	23	
	Obesity	34	
	Severe obesity	20	
Preoperative condition	AIDS	2	0.05
	Neurological disorder	5	
	Neoplasm	2	
	Immunosuppression	1	
Conditions	Diabetes	35	0.02
	Hypertension	24	
	Chronic pulmonary disease	9	
	Chronic renal insufficiency	3	
	Intermittent claudication	4	
	extracardiac arteriopathy	5	
Procedure	Elective surgery	42	0.01
	mitral repair or replacement	30	
	heart transplant	5	
	Aortic valve surgery	17	

Table II, graph I shows that BMI showed healthy 17, overweight 23, obese 34 and severe obese 20 subjects. Preoperative conditions were AIDS in 2, neurological disorders in 5, neoplasm in 2 and immunosuppression in 1 patient. Conditions found were diabetes in 35, hypertension in 24, chronic pulmonary disease in 9, chronic renal insufficiency in 3, intermittent claudication in 4, and extracardiac arteriopathy in 5 patients. Operations performed were elective surgery in 42, mitral repair or replacement in 30, heart transplant in 5 and aortic valve surgery in 17 patients. The difference was significant ($P < 0.05$).

Graph I Patients characteristics

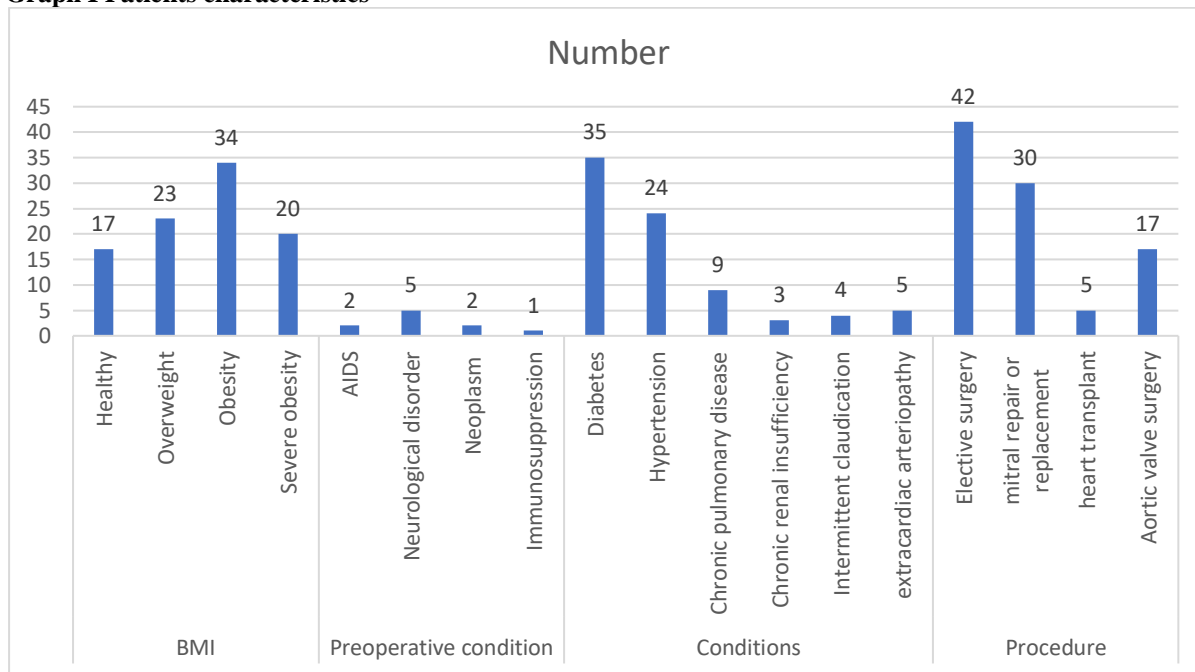


Table III Assessment of mortality rate

Total patients	Mortality	Percentage
94	6	6.3%

Table III shows that out of 94 patients, 6 (6.3%) died.

Table IV Determinants of operative mortality

Variables	OR	P value
Age	1.3	0.01
Female gender	1.6	0.03
Systolic pulmonary pressure >60	2.1	0.01
Neurological dysfunction	2.3	0.01
Serum creatinine >200	1.7	0.03
Extracardiac arteriopathy	1.5	0.04
Chronic pulmonary disease	1.8	0.01
LVEF 30-50%	1.6	0.01
LVEF <30%	2.3	0.01

Table IV shows that common risk factors were advancing age, female gender, systolic pulmonary pressure > 60 neurological dysfunction, serum creatinine >200, extracardiac arteriopathy, chronic pulmonary disease, LVEF 30-50%, and LVEF <30%.

DISCUSSION

Coronary artery bypass graft surgery is an essential and effective revascularization method for patients with coronary artery disease.⁷ Patients formerly considered "too old" or "too sick" can now benefit from surgery thanks to a steady increase in the annual number of CABG surgeries performed since the early 1980s.^{8,9} Mortality and morbidity are significantly correlated with postoperative cardiac events (CE). In-hospital mortality rates have ranged from 15% to 25% for myocardial infarction and up to 65% for cardiac arrest.^{10,11} This study was conducted to assess risk factors for mortality in cardiac surgical adult patients. We found that there were 58 males and 36 females. Males and females in age groups 20-30 years had 6 and 3, 30-40 years had 10 and 7, 40-50 years had 28

and 15 and 50-60 years had 14 and 11 patients. Rannuci et al¹² included 4557 adult patients who had had elective heart surgery. The ACEF score was compared to five other risk scores from the validation series. Accuracy, or discriminatory power, was ascertained by analyzing the operating characteristics of the receiver. The accuracy of the Cleveland Clinic score (0.812) was the greatest, followed closely by the ACEF score (0.808). In isolated coronary surgeries, ACEF had the highest accuracy (0.826), with the Cleveland Clinic score at 0.806. In coronary procedures, the two scores performed similarly (0.815 versus 0.813). We observed that BMI showed healthy 17, overweight 23, obese 34 and severe obese 20 subjects. Preoperative conditions were AIDS in 2, neurological

disorders in 5, neoplasm in 2 and immunosuppression in 1 patient. Conditions found were diabetes in 35, hypertension in 24, chronic pulmonary disease in 9, chronic renal insufficiency in 3, intermittent claudication in 4, and extracardiac arteriopathy in 5 patients. Operations performed were elective surgery in 42, mitral repair or replacement in 30, heart transplant in 5 and aortic valve surgery in 17 patients. In order to determine whether the trend toward higher-risk patients continued and to evaluate the effect of risk on in-hospital outcomes, Warner et al¹³ evaluated patients who had CABG between 1993 and 1995 (group III) and compared them with patients who had the procedure between 1981 and 1987 (group I) and 1988 and 1992 (group II). Significant changes occurred over the course of the three time periods, and the danger rose over time. In group III, mortality declined despite continuous increases in patient risk, but in group II, increasing risk was associated with higher mortality. Group II reported an increase in issues, whereas Group III saw little change. The actual death rate in group III was less than anticipated. We found that out of 94 patients, 6 (6.3%) died. Common risk factors were advancing age, female gender, systolic pulmonary pressure > 60 neurological dysfunction, serum creatinine >200, extracardiac arteriopathy, chronic pulmonary disease, LVEF 30-50%, and LVEF <30%.

In a research by Roques et al¹⁴, the mean age was 62:5, with 28% of the participants being female. The body mass ratio was 26:3 on average. Common risk factors included diabetes (16.7%), extracardiac arteriopathy (2.9%), chronic renal failure (3.5%), chronic pulmonary sickness (3.9%), impaired left ventricular function (31.4%), and previous heart surgery (7.3%). Isolated coronary surgery accounted for 63.6% of all surgeries, and valve operations were performed on 29.8% of patients. Overall, hospital mortality was 4.8%. 3.4% of people died as a result of heart surgery. The fatality rates after coronary surgery were 0.4%, mitral valve surgery was 1%, aortic valve surgery was 1.1%, and atrial septal defect treatment was 0% when no identifiable risk factors were present. Age, gender, serum creatinine, extracardiac arteriopathy, chronic airway disease, severe neurological dysfunction, previous heart surgery, recent myocardial infarction, left ventricular ejection fraction, chronic congestive heart failure, pulmonary hypertension, active endocarditis, unstable angina, urgency of procedure, ventricular septal rupture, noncoronary surgery, and thoracic aortic surgery were risk factors for rising mortality.

CONCLUSION

Authors found that systolic pulmonary pressure > 60, advancing age, female gender, extracardiac arteriopathy, chronic pulmonary disease, neurological dysfunction, serum creatinine >200, LVEF 30-50%, and LVEF <30% are some of the risk factors that lead to cardiac surgical death. This information can be

used to develop a risk stratification approach for assessing the quality of care and estimating hospital mortality.

REFERENCES

- Zingone B, Pappalardo A, Dreas L. Logistic versus additive EuroSCORE: A comparative assessment of the two models in an independent population sample. *Eur J Cardiothorac Surg.* 2004;26:1134–1140.
- D'Errigo P, Seccareccia F, Rosato S, Manno V, Badoni G, Fusco D, Peducci CA, for the Research Group of the Italian CABG Outcome Project. Comparison between an empirically derived model and the EuroSCORE system in the evaluation of hospital performance: the example of the Italian CABG Outcome Project. *Eur J Cardiothorac Surg.* 2008;33:325–333.
- Ivanov J, TU JV, Naylor D. Ready-made, recalibrated, or remodeled? Issues in the use of risk indexes for assessing mortality after coronary artery bypass graft surgery. *Circulation.* 1999;99:2098–2104.
- Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol.* 1996;49:1373–1379.
- Concato J, Feinstein AR, Holford T. The risk of determining risk with multivariable models. *Ann Intern Med.* 1993;118:201–210.
- Jin R, Grunkemeier GL, for the Providence Health System Cardiovascular Study Group. Does the logistic EuroSCORE offer an advantage over the additive model? *Interact Cardiovasc Thorac Surg.* 2006;5: 15–17.
- Shanmugam G, West M, Berg G. Additive and logistic EuroSCORE performance in high risk patients. *Interact Cardiovasc Thorac Surg.* 2005;4:299–303.
- Bhatti F, Grayson AD, Grotte G, Fabri BM, Au J, Jones M, Bridgewater B, for the North West Quality Improvement Programme in Cardiac Interventions. The logistic EuroSCORE in cardiac surgery: how well does it predict operative risk? *Heart.* 2006;92:1817–1820.
- Marshall G, Shroyer ALW, Grover FL, Hammermeister KE. Bayesian-logit model for risk assessment in coronary artery bypass grafting. *Ann ThoracSurg*1994;57:1492-1500.
- Tremblay NA, Hardy JF, Perrault J, Carrier M. A simple classification of the risk in cardiac surgery: the first decade. *Can J Anaesth*1993;40:103-111.
- Pinna Pintor P, Bobbio M, Sandrelli L, Giammaria M, Patane F, Bartolozzi S, Bergandi G, Alfieri O. Risk stratification for open heart operations: comparison of centers regardless of the influence of the surgical team. *Ann ThoracSurg*1997;64:410-413.
- Ranucci M, Castelvechio S, Menicanti L, Frigiola A, Pelissero G. Risk of assessing mortality risk in elective cardiac operations: age, creatinine, ejection fraction, and the law of parsimony. *Circulation.* 2009 Jun 23;119(24):3053-61.
- Warner CD, Weintraub WS, Craver JM, Jones EL, Gott JP, Guyton RA. Effect of cardiac surgery patient characteristics on patient outcomes from 1981 through 1995. *Circulation* 1997;96:1575-1579.
- Roques F, Nashef SA, Michel P, Gauducheau E, De Vincentiis C, Baudet E, Cortina J, David M, Faichney A, Gavrielle F, Gams E. Risk factors and outcome in European cardiac surgery: analysis of the EuroSCORE

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multinational database of 19030 patients. European
Journal of Cardio-thoracic Surgery. 1999 Jun

1;15(6):816-23.