

OPEN HEART SURGERY AT A NEWLY DEVELOPED CARDIAC CENTER IN KARACHI: A STEP TOWARDS AFFORDABLE CARDIAC CARE IN PAKISTAN

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Contribution

MM conceived the idea and designed the study. Data collection and manuscript writing was done by TAA, SSN, MJ, US, ZS and MK. All the authors contributed equally to the submitted manuscript.

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ABSTRACT

Objective: To evaluate the outcomes and cost-effectiveness of cardiac surgery performed in a newly developed center providing affordable surgical care.

Methods: This descriptive study was conducted at the Medicare Hospital Karachi, from January 2016 to October 2017. Patients undergoing open-heart surgery with cardiopulmonary bypass were enrolled, and those presenting with cardiogenic shock and off-pump cardiac surgeries were excluded. Data were prospectively collected on the designed questionnaire.

Results: A 127 consecutive patients, predominantly male, 72%, with an overall median age of 58 ± 15 years were identified. Ninety percent had CABG, 5.5% had MVR, 1.6% had AVR, 0.8% had CABG+MVR, and 1.6% had CABG+AVR. A majority, 50.4%, had 1+2+3 grafts. Sixty percent had a CPB time between 60-90 minutes and ventilation of less than six hours in 88% patients. Peri-operatively 97% of patients received transfusion, 2.4% developed renal dysfunction, 1.6% sepsis, 3.2% arrhythmia, and 71% received inotropes. In-hospital mortality was 1.6%, ICU stay >5 days and hospital stay >8 days was found each in 1.6% of patients respectively.

Conclusion: We demonstrated impressive results compared with strong Western standards. Further comparative studies with greater sample size are required to assess the outcomes, survival, and cost-effectiveness in this region.

Keywords: Coronary artery bypass grafting (CABG), Outcomes, Cost-effectiveness

INTRODUCTION

Coronary artery bypass grafting (CABG) has been the main standard in the treatment and management of Coronary artery disease (CAD) around the globe. Till today it is marked as the best treatment option for patients with left main stem disease, with poor left ventricular function, and uncontrolled diabetes mellitus.^{1,2} Through 2020, CAD is expected to be the major cause of worldwide morbidity and mortality. Pakistan, being a part of Southern Asia has high rates of CAD, manifesting at quite an earlier age.³

The major concern for all patients undergoing CABG is the expensive health care cost leading to financial stress in the common man household. For example, in 2007, about 408,000 CABG surgeries were performed in the United States (US), with a mean amount of charges for in-hospital care over \$10,000.⁴ CAD cost plays a leading position in the entire expense of the health care system which as measured is around 40.7% and mostly cost was associated with in-patients facility which represents 70% of the healthcare expense and medicine treatment.⁵ During the past several decades' efforts have been made in developed countries to contain healthcare costs by reducing the number of hospital readmissions and lowering the use of hospital resources for those already admitted by reducing the length of hospital stay. According to reported literature protocols and guidelines for patients who were having CABG operation in an effort to decrease hospital length of stay (LOS) have been highly successful. The median length of stay for CABG in the year 1988 to 2005 has reduced from eleven to eight days resulting in apparent cost savings in peri-operative care associated with the main procedure.⁶⁻⁸

Since there are few studies available in Pakistan and in this region, which represent the information related to the cost of treatment of CAD, we took the initiative to evaluate the outcomes and cost-effectiveness of cardiac surgery performed in a newly developed center in Karachi, Pakistan.

METHODOLOGY

This descriptive study was conducted at the Medicare Hospital Karachi, Pakistan. Consecutive patients undergoing open-heart surgery with cardiopulmonary bypass were enrolled. Patients presenting with cardiogenic shock and off-pump cardiac surgeries were excluded. Data were prospectively collected on the designed questionnaire from January 2016 to October 2017.

All the patients were operated by consultant cardiac surgeon who had an experience of minimum 5-years post-fellowship. Potential information bias was taken and accepted by verifying the verbal knowledge through hospital chartings and records of the lab.

Statistical package for social (SPSS) version 19 was taken to analyze the data. Descriptive statistics such as mean \pm standard deviation (SD), median (interquartile range), maximum and minimum were calculated for continuous variables. Frequency and percentages were calculated for categorical variables. Odds ratios (OR) are calculated for the outcome taking males as a benchmark. Fisher's Exact test was applied to evaluate the effect of gender on outcome variables. P-value ≤ 0.05 was taken as criteria for statistical significance. The collection of data presented in this article was allowed for use in the study by the Institutional Review Board, with patient consent waived. Confidentiality of the study subjects and information was maintained.

RESULTS

This study was conducted in a newly developed cardiac center evaluating the post-procedural outcomes, i.e., blood transfusion, inotropic support, re-open, renal dysfunction, sepsis, arrhythmia, ICU stay, hospital stay, and mortality. One hundred and twenty-seven consecutive patients undergoing CABG were identified. Patients were predominantly male, 91 (72%), with an overall median age of 58 ± 15 years. The ejection fraction of 40%-50% was found in 38% of the sample and overall in-hospital mortality was reported to be 1.6% (two). Baseline characteristics of patients are presented in Table 1.

In our sample 90% (114) of patients had CABG, 5.5% (seven) had mitral valve replacement, 1.6% (two) had aortic valve replacement, 0.8% (one) had CABG+MVR, and 1.6% (two) had CABG+AVR. A majority of the patients had 1+2+3 grafts, 50.4% (64). Sixty percent of patients had a cardiopulmonary pump time between 60 and 90 minutes and ventilation of less than six hours in 88% (112) patients. A majority of them received blood while undergoing cardioplegia, 91% (116). Procedural details of the patients are presented in Table 2.

On evaluation of post-procedural outcomes, we found that 97% (123) of patients received blood transfusion, 2.4% (three) developed renal dysfunction (post-operative creatinine >1.5), 1.6% (two) had sepsis, 3.2% (four) had arrhythmia, 71% (90) of patients received inotropes; ICU stay of more than five days and hospital stay of more than eight days was found each in 1.6% (two) of patients respectively. Moreover, after identifying independent risk factors for these observed outcomes we observed that the odds of receiving blood transfusion were 1.39 times higher in males as compared to females (OR=1.39, $p=0.61$). Summary and impact of gender of procedural outcomes are presented in Table 3.

Table 1: Baseline characteristics of patients

Total (n = 127)	
Gender	
Male	91 [71.7%]
Female	33 [26%]
Missing	3 [2.4%]
Age	
Mean \pm SD	56.68 \pm 11.65
Median (IQR)	58 (15)
Min-Max	14 - 76
Missing	7 [5.5%]
Up to 50 years	36 [28.4%]
51 to 60 years	40 [31.5%]
More than 60 years	44 [34.7%]
Ejection Fraction	
Normal > 50%	45 [35.4%]
Mild 40 to 50%	48 [37.8%]
Moderate 30 to 40%	17 [13.4%]
Sever < 30%	4 [3.2%]
Missing	13 [10.2%]

SD= standard deviation, IQR=interquartile range

Missing values are ignored while calculating the quantitative summary of the age variable

Table 2: Procedural details of the patients

Total (n = 127)	
Type of surgery	
CABG	114 [89.8%]
MVR	7 [5.5%]
AVR	2 [1.6%]
CABG plus MVR	1 [0.8%]
CABG plus AVR	2 [1.6%]
Missing	1 [0.8%]
Number of graft	
1	2 [1.6%]
1+2	23 [18.1%]
1+2+3	64 [50.4%]
1+2+3+4	25 [19.7%]

CABG = coronary artery bypass grafting; MVR = mitral valve replacement; AVR = aortic valve replacement

1+2+3+4+5	1 [0.8%]
Missing	12 [9.5%]
Valve Type	
Mechanical	4 [3.2%]
Tissue	2 [1.6%]
Missing	121 [95.3%]
Pump Time	
Less than 60 minutes	19 [15%]
60 to 90 minutes	76 [59.8%]
90 to 120 minutes	24 [18.9%]
120 to 150 minutes	1 [0.8%]
More than 180 minutes	1 [0.8%]
Missing	6 [4.7%]
Cardioplegia	
Blood	116 [91.3%]
Crystalloid	2 [1.6%]
Missing	9 [7.1%]
Ventilation	
Less than 6 hours	112 [88.2%]
More than 6 hours	8 [6.3%]
Missing	7 [5.5%]

Table 3: Summary and impact of gender of procedural outcomes

	Frequency n [%]	OR (Male/Female)	p-value
Blood Transfusion	123 [96.9%]	1.39	0.61
Mortality	2 [1.6%]	0.36	0.47
Re-open	1 [0.8%]	-	0.27
Renal Dysfunction (post op creatinine >1.5)	3 [2.4%]	0.73	0.61
Sepsis	2 [1.6%]	0.36	0.46
Arrhythmia	4 [3.1%]	0.72	0.61
ICU stay of patient > 5 days	2 [1.6%]	0.36	0.46
Hospital stay > 8 days	2 [1.6%]	-	0.07
Inotropic used	90 [70.9%]	0.82	0.43

ICU = intensive care unit; OR = odds ratio

DISCUSSION

Pakistan is one of the densely populated countries in the world, and its current population is 207.8 million with a rise

of 75.4 million people in 19 years according to provisional summary data of the 6th Population and Housing Census 2017. However, the quality of health care provided to patients varies considerably between urban and rural

populations. Current literature shows that the rural community is very much vulnerable than its urban counterparts. If we compare they are older, education is less, more likely to be nonworking, and more towards the economic downturn. Also, medical care given to rural populations can be a challenge because there are very fewer hospital specialists, providers and longer distances among places where people live and hospitals.^{9,10} After knowing this background, in this study, we observed the outcomes of a newly developed health center with excellent quality of treatment provided to patients having coronary artery disease presenting for CABG. Through our findings, we would like to compel the readers the fact that every individual should have equal opportunity to be treated regardless of their economic status. The difference in care for CABG patients between tertiary care hospitals and newly developed centers may be minimized or eliminated.

According to literature our neighboring country China has progressed a lot in population health facilities, increasing the insurance coverage, research facilities and strengthening the primary care system.¹¹ However, residents of our country do not have health insurance and must pay for their health facilities; therefore, residents look for an affordable but reliable setup. Similarly, a study conducted in Taiwan reported that the urban population is more affordable and has better health care facilities than the people living in rural areas.¹² Countries like Bangladesh and India have a similar healthcare system like ours and have better health facilities for urban dwellers suffering from cardiovascular diseases.^{13,14}

Our data reported in-hospital length of stay of no more than eight days and a mortality rate of 1.57%. These findings are consistent with statistics published in a study that discusses outcomes in patients undergoing CABG in developing countries.¹¹ Improved results from our newly established center endorse the fact that we are providing affordable essential health care services, bringing continuous improvement to the infrastructure of our hospital and strengthening the primary care system. These efforts will improve the health outcomes in patients with CAD and equally distribute the patient burden amongst the newly developed hospitals providing quality care treatment. Enhanced surgical techniques and perioperative management might be the reason for this reduction in mortality along with reduced hospital LOS. Postoperative complications also had an impact on the ability of the patient to work after the operation and are especially relevant in countries like ours where job providers may not give financial support, and the patient must pay from their own pocket. Most of these aspects are not even considerations in developed countries where health insurance comes in to play. Therefore, patients residing in developing countries place their belief in healthcare staff, hence, it is designated

that perioperative outcomes in potentially dangerous surgeries like CABGs, continue to improve.

A major priority for clinicians should be that each patient must have an equal right to get the best health potentials, without being disadvantaged due to low economic status.¹⁴ Quality has been the main foci in utmost developed countries in the past few years.¹⁵ However, cost remains a point of concern for the developing nations, as individuals are not insured in these regions and must pay on their own.¹⁶ Objective assessment and performance can be monitored by the establishment of a database¹¹ on a national level so that the outcomes of each institution can be compared. Some newly developed centers with a skillful team of surgeons, anesthetics, perfusionists; post-operative care along with accurate preoperative diagnosis can provide adequate outcomes with less burden on the patient.¹⁷

Quality treatment and measurements of outcome have become one of the critical emphases of recent healthcare improvements in Pakistan. International healthcare conferences and further overseas education give opportunities for Pakistani surgeons to get knowledge of novel cardiovascular disease-related treatments, as well as advancement in outcome research topics globally. Moreover, having higher CABG volume benefits the surgeon from the volume-outcome relationship more in cardiac surgery.¹⁸ Furthermore, our results show that care that is given like in the western health care system can be reached in a developing country and newly developed center providing high-class healthcare to their patients. We have very good cardiac surgery facilities, more great and advanced resources so that the patients who undergo CABG receive ideal possible support.

Finally, one more improvement needed is to decrease the difference in CABG care between large teaching hospitals and often non-teaching small hospitals in urban and rural areas. Our findings relied on an urban hospital that used to have more resources. Most of the health service providers are less qualified in rural areas. Numerous ways have been decided to upgrade competencies for rural health workers throughout the country, like continued medical education and on-hand workshops for government healthcare professionals.

CONCLUSION

This newly developed center in Karachi has indicated very impressive CABG results in comparison with strong international certified standards. This should stimulate other hospitals in the region to direct one's hope to high levels of care. The postoperative circumstances are being curtailed in developing countries and the excellence of health care must progress without interruption to alleviate these problems.

Further comparative studies with a higher sample size are required to assess the outcomes, survival, and cost-effectiveness in this region.

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