Section: Miscellaneous

Original Research Article

IMPACT OF OPEN HEART SURGERY ON QUALITY OF LIFE

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ABSTRACT

Background: Open heart surgery aims not only to improve survival but also to enhance postoperative quality of life. The objective is to evaluate changes in health-related quality of life before and after open heart surgery using the Short Form-36(SF-36) questionnaire.

Materials and Methods: Total 100 patients undergoing open heart surgery analyzed for quality of life. SF-36 scores were compared preoperatively and postoperatively using paired t test.

Results: Significant improvements were observed across all eight SF-36 domains, with the largest improvement in physical functioning and role-physical domains ($p < 0.05$).

Conclusion: Open heart surgery leads to significant and clinically meaningful improvements in both physical and mental components of quality of life.

Keywords: Open heart surgery; SF-36; Quality of life; Cardiac surgery outcomes; Health-related quality of life.

INTRODUCTION

Cardiovascular disease remains a major cause of illness and disability, and a large number of patients ultimately require open heart surgery to improve symptoms and restore functional capacity. Globally, coronary heart disease is a highly prevalent cardiovascular condition and remains a leading contributor of morbidity and mortality.[1] With steady advances in surgical techniques and perioperative care, survival after cardiac surgery has improved substantially; as a result, attention has gradually shifted from survival alone to outcomes that matter directly to patients in their everyday lives.[2] Health-related quality of life (HRQoL) has therefore become an important measure of surgical success, as it reflects the patient's physical functioning, emotional well-being, and ability to participate in social activities after recovery.[3] Despite its clinical relevance, information on postoperative quality of life among Indian and regional cardiac surgery populations is limited, and such outcomes are not routinely reported. The Short Form-36 (SF-36) health survey is a well-validated and widely accepted tool that allows comprehensive assessment of both physical and mental aspects of health.[4,5]

In this context, the present study was undertaken to compare quality-of-life scores before and after open heart surgery using the SF-36 questionnaire, with the primary aim of evaluating overall change in HRQoL and a secondary aim of examining the extent of improvement across individual physical and mental health domains. To our knowledge, limited studies from regional Indian cardiac surgery populations have systematically evaluated these outcomes using standardized instruments.

MATERIALS AND METHODS

This observational before and after study was conducted to assess changes in health-related quality of life among patients undergoing open heart surgery. This study was carried out in the Cardio-Thoracic and Vascular Surgery Department in collaboration with the Department of Pharmacology, Sawai Man Singh Medical College and Hospital, Jaipur.

The study was approved by the Institutional Ethics Committee (Reference No.-157 MC/EC/2020, Dated:

20.04.2020), and patient confidentiality was maintained. Data collection for the study was done for the period of one year after getting approval from the Institutional Ethical. A total of 100 patients were included in the analysis, all of whom underwent elective coronary artery bypass grafting (CABG) and had complete quality-of-life data available both before and after surgery. Surgical management and treatment of the patients were based on a common standard protocol.

Patients with incomplete SF-36 questionnaires, those undergoing re-operations, or those requiring emergency surgery were excluded to ensure consistency and reliability of outcome assessment. Demographic information, including age and sex, was obtained. Health-related quality of life was evaluated using the SF-36 health survey, a well-validated instrument that measures both physical and mental aspects of health. The questionnaire was administered preoperatively and again during postoperative follow-up, allowing direct comparison of quality-of-life status within the same individuals. Health-related quality of life (HRQOL) in the study participants was assessed using the SF-36 questionnaire. This tool examines quality of life across eight key domains that reflect physical, emotional, and social well-being: physical functioning, role limitations due to physical health, role limitations due to emotional problems, social functioning, bodily pain, mental health, vitality, and general health. The questionnaire captures the individual's health status during the four weeks prior to completion, reducing the effect of short-term or temporary health fluctuations. Responses are scored using a standardized method and converted to a scale of 0 to 100 for each domain, with higher scores representing better perceived health.

Statistical Analysis: Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS), version 21.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Prior to parametric testing, the distribution of differences for each SF-36 domain was assessed using the Shapiro-Wilk test. All domains followed a normal distribution ($p > 0.05$), justifying the use of the Paired t-test. To account for the risk of Type I errors arising from multiple comparisons across eight domains, a Bonferroni correction was considered, setting a stricter significance threshold of $p < 0.006$.

Comparisons of preoperative and postoperative SF-36 domain scores were performed using the paired t-test, as measurements were obtained from the same individuals at two time points. A two-tailed p-value of less than 0.05 was considered statistically significant for all analyses. To evaluate the influence of age on postoperative improvement in health-related quality of life, linear regression analysis was performed. For each SF-36 domain, the change score (postoperative minus preoperative score) was used as the dependent variable, with age entered as a continuous independent predictor. Regression coefficients (β), 95% confidence intervals (CI), and p-values were reported. Assumptions of linearity, normality of residuals, and homoscedasticity were assessed and found to be acceptable. A two-tailed p-value < 0.05 was considered statistically significant.

RESULTS

The study had a mean age of 61.8 years (SD 10.7), reflecting typical cardiac surgery populations with moderate age-related risk. Males predominated at 78% (n=78), consistent with higher coronary artery disease prevalence in men, while females comprised 22% (n=22).

[Table 1 and Figure 1] presents baseline demographic characteristics for 100 patients undergoing elective CABG.

Table 1: Baseline Characteristics of Patients Undergoing Open Heart Surgery

Variable	Total (n = 100)
Age (years)	
Mean ± SD	61.8 ± 10.7
Sex, n (%) Male Female	 78(78.00%) 22(22.00%)

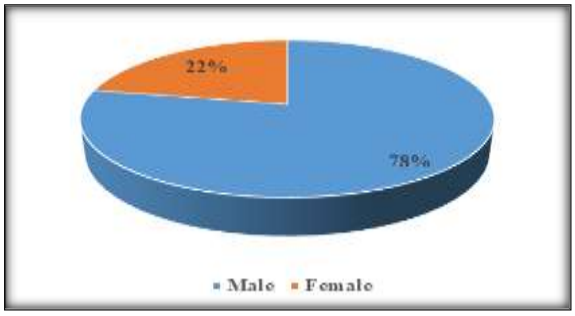

Figure 1: Gender Distribution of Study Participants (n = 100)

[Table 2 and Figure 2] presents pre-operative and post-operative SF-36 scores across all eight domains, showing statistically significant improvements ($p<0.001$ to 0.04). Physical functioning rose from 45.3±18.2 to 71.6±16.4 (+26.3 points), role-physical from 38.5±20.1 to 68.4±18.7 (+29.9 points), and bodily pain from 52.8±17.3 to 72.1±15.6 (+19.3 points) patients. Mental health domains gained 16-24 points, with vitality (+19.1) and social functioning (+23.1) showing strongest points). Physical domains improved most (20-30 point gains), exceeding the 5-10 point minimal clinically important difference for cardiac surgery significance (p=0.001). Overall, the

mean improvements in physical domains (ranging from 20 to 30 points) exceeded the established Minimal Clinically Important Difference (MCID) for cardiac populations.[6,7]

Table 2: Comparison of SF-36 Scores Before and After Surgery (n = 100)

SF-36 Domain	Before Surgery (Mean ± SD)	After Surgery (Mean ± SD)	p-value
Physical Functioning	45.30 ± 18.20	71.60 ± 16.40	0.01*
Role Physical	38.50 ± 20.10	68.40 ± 18.70	0.04*
Bodily Pain	52.80 ± 17.30	72.10 ± 15.60	0.003*
General Health	49.20 ± 14.80	66.90 ± 13.90	0.002*
Vitality	44.60 ± 15.20	63.70 ± 14.50	0.001*
Social Functioning	50.10 ± 18.40	73.20 ± 16.10	0.001*
Role Emotional	46.70 ± 19.30	70.80 ± 17.50	0.04*
Mental Health	51.90 ± 14.70	68.50 ± 13.60	0.002*
P-values calculated using **paired t-test** to compare SF-36 scores before and after surgery. A p-value < 0.05 was considered statistically significant. SF-36: Short Form-36 Health Survey.			

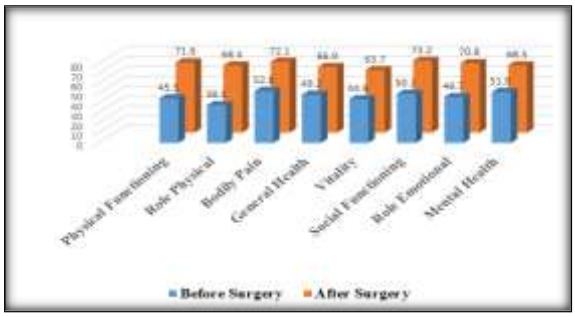

Figure 2: Depicting pre- and postoperative SF-36 scores across all eight domains

[Table 3] shows changes in selected SF-36 domains before and after surgery. Postoperative scores demonstrated significant improvements in Physical Functioning, Role Physical, and Social Functioning, with large effect sizes, indicating clinically meaningful gains in health-related quality of life. Mean increases ranged from 23.1 to 29.9 points, with all domains demonstrating large effect sizes (Cohen's d > 1.3). The large effect sizes indicate that these changes are not only statistically significant but also clinically meaningful, reflecting tangible benefits in postoperative functional recovery.

Table 3: Shows changes in selected SF-36 domains before and after surgery.

SF-36 Domain	Pre-Op Mean (SD)	Post-Op Mean (SD)	Mean Change	Cohen's d
Physical Functioning	45.30 (18.2)	71.60 (16.4)	+26.3	1.52
Role Physical	38.50 (20.1)	68.40 (18.7)	+29.9	1.54
Social Functioning	50.10 (18.4)	73.20 (16.1)	+23.1	1.34

Linear regression analysis demonstrated that age was a significant predictor of improvement in selected SF-36 domains following open heart surgery. Increasing age was associated with smaller gains in Physical Functioning (β = −0.42, p = 0.003) and Role Physical (β = −0.38, p = 0.01), indicating that younger patients experienced greater postoperative improvement in physical health domains (Table-4). In contrast, age was not significantly associated with improvement in Social Functioning or Mental Health domains (p > 0.05), suggesting that psychosocial recovery following surgery was largely independent of age.

Table 4: Linear regression analysis demonstrated that age was a significant predictor of improvement in selected SF-36 domains following open heart surgery

SF-36 Domain	β Coefficient	95% CI	p-value	Interpretation
Physical Functioning	−0.42	−0.69 to −0.15	0.003*	Older age less improvement
Role Physical	−0.38	−0.65 to −0.10	0.01*	Significant negative association
Social Functioning	−0.12	−0.31 to 0.07	0.21	Not significant
Mental Health	−0.08	−0.27 to 0.11	0.39	Not significant

In [Figure 3], the regression analysis highlights a statistically significant inverse relationship between patient age and the degree of physical recovery following surgery (beta = -0.42, p = 0.003). With the X-axis centered on the study's mean age of 61.8 ±10.7 years and the Y-axis representing the postoperative "change score," the data points for the 100-patient cohort reveal a clear trend: the red regression line slopes downward, indicating that as age increases, the magnitude of improvement in physical functioning tends to decrease. This suggests that while all age groups benefit from the procedure, younger patients typically experience a more robust restoration of their physical health compared to their older counterparts.

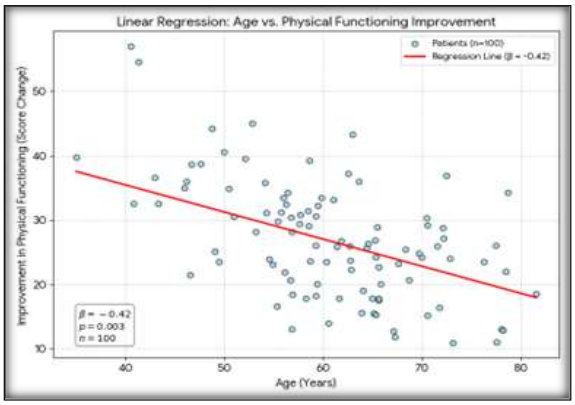

Figure 3: Age's Impact on SF-36 Outcomes

DISCUSSION

The present study demonstrates that open heart surgery is associated with significant improvements in health-related quality of life across all eight domains of the SF-36 questionnaire. The greatest gains were observed in the physical domains, particularly physical functioning and role-physical, while improvements in mental and social health were also evident. These findings highlight that the benefits of cardiac surgery extend beyond survival and symptom control, contributing meaningfully to patients' overall well-being and functional independence.

The pattern of improvement observed in our study is consistent with findings from recent studies evaluating quality-of-life outcomes after CABG. A prospective study by Pačarić et al,[4] reported significant improvement in all SF-36 domains following CABG, with particularly large gains in physical functioning and bodily pain scores. The authors noted that surgical revascularization relieves angina and improves exercise tolerance, which translates into better daily functioning and overall health perception. Similar improvements in physical health domains have also been documented in several contemporary observational studies examining postoperative HRQoL in cardiac surgery populations.[5-8]

In the present study, physical functioning improved by more than 26 points and role-physical by nearly 30 points, indicating substantial functional recovery after surgery. Improvements of this magnitude are well above the minimal clinically important difference reported for cardiac populations, suggesting that the observed changes are not only statistically significant but also clinically meaningful. A recent study published in 2024 evaluating quality of life one year after CABG similarly reported marked improvement in physical activity levels and daily functioning among postoperative patients, supporting the view that surgical revascularization leads to sustained improvements in physical health status.[9,10]

An important observation in the present study was the inverse relationship between age and improvement in physical domains of health-related quality of life. Younger patients demonstrated greater improvement in physical functioning and role-physical scores compared with older patients following surgery. These findings are supported by several studies suggesting that younger individuals tend to recover physical capacity more rapidly after cardiac surgery due to better physiological reserve, lower comorbidity burden, and greater baseline functional capacity.[11]

A cohort study evaluating outcomes up to 12 years after coronary artery bypass grafting found that although all age groups experienced improvements in HRQoL, younger patients maintained better physical and mental health scores over time compared with older individuals. The elderly patients showed smaller gains and greater decline in physical component scores during long-term follow-up, suggesting that aging may limit sustained improvements in postoperative quality of life.[12]

Similarly, studies examining postoperative trajectories of SF-36 scores after cardiac surgery have demonstrated that older patients tend to experience smaller improvements in physical functioning and vitality compared with younger patients during follow-up. These differences are often attributed to age-related physiological decline, higher prevalence of chronic comorbidities, and slower postoperative rehabilitation.[1]

In addition, other research evaluating quality of life after CABG has reported that older patients may even demonstrate greater relative improvement in some domains because they typically have poorer baseline health status prior to surgery. Consequently, the magnitude of improvement can appear larger in elderly populations despite lower absolute postoperative scores.[12]

However, not all studies have reported age as a limiting factor in postoperative quality-of-life improvement. Several investigations have shown that elderly patients can experience improvements comparable to those of younger individuals. For instance, a study assessing HRQoL after cardiac surgery found that improvements in most SF-36 domains were similar between younger and older patients, and age itself was not an independent predictor of postoperative improvement in quality of life.[5]

Importantly, the present study also found that age was not significantly associated with improvements in social functioning or mental health domains. This observation is consistent with previous research suggesting that psychosocial recovery following cardiac surgery may be less dependent on age. Improvements in emotional well-being, social participation, and perceived health status are influenced by multiple factors including relief from symptoms, family support, and successful postoperative rehabilitation rather than chronological age alone.[13]

From a clinical perspective, these findings reinforce the importance of evaluating outcomes beyond traditional measures such as mortality and perioperative complications. Demonstrating meaningful improvement in quality of life supports the overall benefit of open heart surgery in restoring patients' functional independence and daily well-being. Routine assessment of health-related quality of life during follow-up can provide valuable insight into patient recovery, guide rehabilitation strategies, and support patient counseling regarding expected postoperative outcomes.

The massive gain in the 'Role Physical' domain (+29.9 points) is particularly noteworthy. This domain measures the extent to which physical health interferes with work or other daily activities. In the Indian context, where many patients in this age group (mean 61.8 years) remain active in family businesses

or household management, this improvement represents a shift from total functional dependency to active participation in daily life.

A major strength of this study is the use of the SF-36 questionnaire, a validated and widely accepted instrument for assessing health-related quality of life across diverse patient populations. In addition, the paired before–after study design allowed each patient to serve as their own control, reducing inter-individual variability and strengthening the reliability of observed changes in quality-of-life scores.

The observed inverse relationship between age and improvement in physical SF-36 domains suggests that younger patients derive greater functional benefit from open heart surgery, likely due to better physiological reserve and faster postoperative recovery. However, the lack of association between age and mental or social health improvement indicates that psychosocial benefits of surgery extend across age groups. These findings highlight the importance of individualized rehabilitation strategies, particularly for older patients, to optimize physical recovery following cardiac surgery.

Limitations: This study has certain limitations that should be considered when interpreting the findings. As the study was conducted at a single center, the results may not be fully generalizable to other institutions or broader populations with different patient profiles or perioperative practices. Additionally, the analysis was limited to short-term preoperative and postoperative assessments; the absence of long-term follow-up restricts evaluation of the durability of quality-of-life improvements over time. Subgroup analyses based on factors such as sex, or type of surgical procedure were not performed, which may have provided further insight into differential recovery patterns among patient groups.

CONCLUSION

Open heart surgery was associated with significant and meaningful improvements in health-related quality of life in our study, with patients reporting better physical, emotional, and social well-being after the procedure. The most notable gains were seen in physical functioning and role-physical domains, suggesting that surgery helps patients regain their ability to perform daily activities and improves overall functional capacity. Although younger patients showed greater improvement in physical health domains, the benefits in mental health and social functioning were observed across all age groups, indicating that the psychological and social advantages of surgery extend to both younger and older patients. Overall, these findings highlight that the value of open heart surgery goes beyond survival alone, as it plays an important role in restoring patients' independence, daily functioning, and overall quality of life. Incorporating routine quality-of-life assessments such as the SF-36 into postoperative care may therefore help clinicians better understand patient recovery and support more patient-centered cardiac care.

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