

## EVALUATION OF PSYCHIATRIC DISTURBANCES ASSOCIATED WITH OPEN-HEART SURGERY

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**Abstract:** This study assessed QOL, cognitive profile, and psychiatric symptoms before and after open heart surgery. The prospective study was conducted at the Faisalabad Institute of Cardiology from January 2022 to January 2023. A total of 95 patients were included in the study. All patients underwent neurological and physical evaluations. Every measure was assessed preoperatively and postoperatively. The effects of treatment-related factors and patient-related ones were analyzed. 27 (28%) patients had preoperative anxiety, which decreased to 10 (10.5%) after 1 week of surgery and to 6 (6.3%) after 6 months. 18 (18.9%) patients had preoperative depressive symptoms, which decreased to 7 (7.3%) patients after 1 week of surgery and 6 (6.3%) after 6 months. There was a significant improvement in the mean value of anxiety over the study period ( $P < .001$ ). Regarding depressive symptoms, there was no significant improvement after 1 week ( $P < .208$ ). Diabetes mellitus and age were inversely correlated with anxiety and depression; this correlation was statistically significant. Delirium, ischemic time, total bypass time, age, and hypertension were significant predictive factors of cognitive performance. Based on the results, it can be concluded that anxiety and depression adversely impacted the quality of life and were improved gradually over time. Cognitive function declined early after surgery and improved after 6 months.

**Keywords:** Cognitive function, Psychiatric disturbance, open heart surgery

### Introduction

Post-operative psychiatric disturbances are major complications of cardiac surgery (Martin and Cheng, 2021). Estimated 23% of patients develop major depression, and 60% experience mild depressive symptoms following cardiac surgery, this results in the degeneration of venous grafts and poor quality of life (Gecaite et al., 2019). Approximately 40% had anxiety symptoms before surgery and were expected to gradually improve a few weeks after it (Kim et al., 2022). Another major issue associated with cardiac surgery is post-operative cognitive decline. A study reported that the cognitive profile in CABG patients gradually improves over 1 year after surgery (Jovin et al., 2019). Conversely, another study shows that in CABG patients, cognitive performance improves during the early period and declines later (Stanley and Sellke, 2022). Another study reported that uncomplicated open-heart surgery does not affect cognitive function. Now a day, cardiac surgical intervention is aimed at alleviating symptoms, increasing survival rate, and improving quality of life (QOL) after surgery (Köhler et al., 2020). It is important to assess the severity, course, and time of cognitive decline to design to suitable neuroprotective approach (Stanley and Sellke, 2022).

Local research on psychiatric and neurological disturbances following cardiac surgery is scarce. Thus, this aim is to assess QOL, cognitive profile and psychiatric symptoms before and after open heart surgery.

### Methodology

The prospective study was conducted at the Faisalabad Institute of Cardiology from January 2022 to January 2023. The study included patients aged between 18 to 65 years who had completed > 6 years of education (so they could be psychologically evaluated) and underwent open heart surgery. Patients who had a history of neurological, psychiatric, or serious metabolic disturbances which may affect cognitive functions were excluded. A total of 95 patients were included in the study. The informed consent of the participants was recorded. The ethical board of the hospital approved the study. All patients underwent neurological and physical evaluations. Laboratory evaluation (liver function test, serum creatinine level, serum urea, complete blood count) was done preoperatively to exclude metabolic disorders. The psychiatric evaluation included a psychometric test and Hospital Anxiety

and Depression Scale (HADS) (Saidi et al., 2021). Every measure was assessed preoperatively and postoperatively. The Mini-Mental State Examination (MMSE) was used to measure cognition (Albanna and Al-Amin, 2020). The Wechsler Adult Intelligence Scale (WAIS-IV) was used for assessing cognitive domains (visuospatial memory, verbal memory, and attention/psychomotor speed) (Abou-Mrad et al., 2017). The health-related quality of life (HRQOL) was assessed through the Short Form 36 questionnaire (LoMartire et al., 2020). The effect of treatment-related factors (length of ICU stay, type of surgery, total bypass time, and ischemic type) and patient-related factors (sex, age, comorbidities, and health) were analyzed. SPSS version 20.0 was used for data analysis. Quantitative data were represented as mean and standard deviation. Qualitative data were represented as frequency and percentage. Different times of the study period were compared using a one-way analysis of variance (ANOVA). Data were correlated using Pearson's correlation coefficient ( $r$ ) test.  $P \leq 0.05$  was considered statistically significant.

## Results

The age of the participants was  $46.8 \pm 12.2$  years. There were 50 (52.6%) males and 45 (50%) females. The majority of patients (78, 82%) were smokers. Regarding comorbidities, 12 (12.6%) patients had diabetes, and 29 (30.5%) were hypertensive. Valve replacement surgery, CABG, and both combined were performed in 70 (73.6%), 23 (24.2%), and 2 (2.1%) patients, respectively. During surgical intervention, the mean intraoperative bypass time

was  $132.46 \pm 35.05$  minutes, and the mean ischemic time was  $90.32 \pm 28.96$  minutes. After surgery, the mean intensive care unit stays at  $4.37 \pm 3.27$  days. 27 (28%) patients had preoperative anxiety, which decreased to 10 (10.5%) after 1<sup>st</sup> week of surgery and to 6 (6.3%) after 6 months. 18 (18.9%) patients had preoperative depressive symptoms, which decreased to 7 (7.3%) patients after 1 week of surgery and 6 (6.3%) after 6 months. There was a significant improvement in the mean value of anxiety over the study period ( $P < .001$ ). 1<sup>st</sup> post-operative week was associated with a significant improvement in anxiety symptoms. Regarding depressive symptoms, there was no significant improvement after 1 week ( $P < .208$ ) (Table I). Regarding cognitive performance, the decrease in MMSE score 1 week after surgery was insignificant ( $P < .238$ ). The mean value of Block design, Digital symbol, Arithmetic, and Digit span decreased significantly after 1 week of surgery (Table I). The mean SF 36 showed a significant difference over the study period. The mean of 8 SF36 domains was higher 1 week and 6 months after surgery than before it. Diabetes mellitus and age were inversely correlated with anxiety and depression; this correlation was statistically significant. Delirium, ischemic time, total bypass time, age, and hypertension were significant predictors of cognitive performance. ICUL-LOS and diabetes mellitus were inversely correlated to HRQOL (Table II). Anxiety and depression scales were significantly inversely correlated with HRQOL (mental and physical components).

**Table I Cognitive performance and psychiatric symptoms of patients during follow up period**

|                         | Preoperative      | After 1 <sup>st</sup> week | After 6 months    | P value |
|-------------------------|-------------------|----------------------------|-------------------|---------|
| <b>HADS scales</b>      |                   |                            |                   |         |
| Anxiety                 | $7.98 \pm 4.21$   | $6.56 \pm 3.4$             | $5.93 \pm 2.7$    | 0.001*  |
| Depression              | $7.2 \pm 3.1$     | $6.6 \pm 3.0$              | $5.8 \pm 3.2$     | 0.017   |
| MMSE                    | $25.71 \pm 1.47$  | $25.56 \pm 1.71$           | $25.84 \pm 1.61$  | 0.316   |
| <b>WAIS-IV subtests</b> |                   |                            |                   |         |
| Digit symbol test       | $39.79 \pm 14.61$ | $32.34 \pm 14.8$           | $41.47 \pm 15.03$ | 0.001   |
| Forward span            | $7.64 \pm 2.25$   | $6.98 \pm 2.34$            | $7.81 \pm 2.56$   | 0.026   |
| Backward Span           | $5.53 \pm 2.7$    | $4.72 \pm 2.23$            | $5.83 \pm 2.37$   | 0.007   |
| Arithmetic test         | $7.99 \pm 1.578$  | $7.25 \pm 1.584$           | $7.98 \pm 1.679$  | 0.012   |
| Block design test       | $25.21 \pm 9.607$ | $20.48 \pm 5.5$            | $27.19 \pm 8.172$ | 0.001   |

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**Table II Linear regression analysis of the factors affecting function outcomes**

| Variable                | Odds ratio (95% CI) | P value |
|-------------------------|---------------------|---------|
| <b>HADS depression</b>  |                     |         |
| Age                     | .543 (.292–.956)    | 0.012   |
| Diabetes                | 0.506 (0.351–0.817) | 0.041   |
| <b>HADS anxiety</b>     |                     |         |
| Age                     | 0.563 (0.421–0.831) | 0.024   |
| Diabetes                | .622 (0.248–0.931)  | 0.039   |
| <b>Cognition</b>        |                     |         |
| Age                     | 2.418 (1.554–6.514) | 0.014   |
| Hypertension            | 0.556 (0.215–0.734) | 0.043   |
| Ischemic time           | 2.428 (1.584–9.632) | 0.041   |
| Total bypass time       | 2.612 (1.285–8.912) | 0.029   |
| Delirium                | 2.514 (1.984–7.539) | 0.001   |
| <b>SF-36 (physical)</b> |                     |         |
| Diabetes                | 0.514 (0.156–0.838) | 0.017   |
| ICU-LOS                 | 1.432 (1.336–4.201) | 0.001   |
| <b>SF-36 (mental)</b>   |                     |         |
| Diabetes                | 1.835 (1.317–7.537) | 0.044   |
| ICU-LOS                 | 1.632 (1.213–2.689) | 0.002   |

## Discussion

Different studies have reported an association between cardiovascular surgery and psychiatric problems (Açikel, 2019). This study reported that anxiety scales improved significantly after 1<sup>st</sup> post-operative week compared to baseline. There was a significant improvement in depressive symptoms after 6 months of surgery to the preoperative baseline value. This was in line with the previous study, which found that anxiety and depressive symptoms declined after 6 weeks of surgery (Kazitani et al., 2022). Another study found that longer preoperative hospital stay was associated with higher anxiety scores (Jia et al., 2021). In the current study, 28% of patients had anxiety symptoms, and 18.9% had depressive symptoms preoperatively. Previous studies showed that the prevalence of anxiety symptoms varied from 21% -35% and the prevalence of preoperative depressive symptoms from 9% - 47% (Açikel, 2019; Silva et al., 2020). This variability can be accounted to use of several scales, various tools for diagnosis, and different selection criteria. In the current study, there was no impact of gender on HADS, which is in contrast with a previous study that reported high preoperative anxiety levels in women (Hernández-Palazón et al., 2018). This variation can be attributed to hormonal changes in women. In the current study, smoking had no

significant impact on the HADS score, which was in line with the previous study's findings (McCaffrey et al., 2022). A substantial correlation between ICU stay and HADS Scale was reported in the current study; this finding was in line with the previous study (Hernández-Palazón et al., 2018). The current surgery reported a decline in cognitive performance after 1<sup>st</sup> post-operative week, which improved significantly during the subsequent six months. A previous study also reported a cognitive decline in 44% of CABG patients during 1<sup>st</sup> post-operative week, followed by gradual improvement (Yuan and Lin, 2019). On the contrary, another study found that memory impairment after open heart surgery may persist for months (Tachibana et al., 2021). In this study, delirium, ischemic time, total bypass time, age, and hypertension were associated with cognitive performance and inversely correlated. A previous study also reported a strong correlation between hypertension and cognitive impairment (Sarna et al., 2022). In the current study, HRQOL improved significantly after the first post-operative week and remained stable over the next six months. This finding was in line with a previous study, which also reported significant improvement in HRQOL over six months after cardiac surgery (Spindler et al., 2019). Diabetes mellitus and ICU-LOS were significant predictors of physical and mental HRQOL. A previous study found that post-operative ICU stays of more than 3 days and diabetes mellitus

are associated with poor QOL (Younes et al., 2019). These findings show that pre- and post-operative psychiatric consultation is important to improve function in cardiac patients. The major limitation of this study is the short follow-up period and lack of control. A more detailed analysis is recommended to confirm the findings of our study.

### Conclusion

Anxiety and depressive symptoms adversely impacted the quality of life and were improved gradually over time. Cognitive function declined early after surgery and improved after 6 months.

### Conflict of interest

The authors declared absence of conflict of interest.

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