

Original Article

# Effects of Mindfulness Based Therapy on Patients Perception of Illness and Depression in Cardiac Rehabilitation Phase-I

Sonia Ilyas<sup>1</sup>, Aliya Navroz<sup>2</sup>, Raiha Saleem<sup>3</sup>, Nida Naz<sup>4</sup>, Nairish karim<sup>5</sup><sup>1</sup> Physiotherapist, Stoneycroft Medical Centre, United Kingdom<sup>2</sup> Student, Bournemouth university, Bournemouth, United Kingdom, MSc Clinical And Developmental Neuropsychology<sup>3</sup> Exercise Physiologist, Ameristar Staffing Inc., United States<sup>4</sup> Lecturer, MARS Institute of Health Sciences for Women, Lahore, Pakistan<sup>5</sup> Physiotherapist, Prathna Health Care Clinic, Behind Legend Arena Lane 2 Delton Market Dha Phase 5, Karachi, Pakistan\*Corresponding author: Sonia Ilyas, [sonaielyas36@gmail.com](mailto:sonaielyas36@gmail.com)**"Cite this Article"** Received: 01 May 2026; Accepted: 27 May 2026; Published: 09 June 2026**Author Contributions:** Concept, design, data collection, analysis, drafting, critical revision, and final approval: SI, AN, RS, NN, NK. **Ethical Approval:** Indus University, Department of Allied Health Sciences, Karachi, Pakistan. **Informed Consent:** Written informed consent was obtained from all participants; **Conflict of Interest:** The authors declare no conflict of interest. **Funding:** No external funding; **Data Availability:** Available from the corresponding author on reasonable request; **Acknowledgments:** N/A.

## ABSTRACT

**Background:** Cardiac rehabilitation improves recovery after cardiac surgery, yet depressive symptoms, maladaptive illness perception, and reduced health-related quality of life may limit rehabilitation engagement and functional recovery. Mindfulness-based therapy may complement conventional rehabilitation by improving stress regulation, emotional adjustment, and adaptive coping. **Objective:** To determine the effect of mindfulness-based therapy combined with conventional cardiac rehabilitation on illness perception, depression, health-related quality of life, blood pressure, and heart rate among patients undergoing Phase I cardiac rehabilitation. **Methods:** This randomized controlled trial was conducted at Punjab Institute of Cardiology, Lahore, among 48 hemodynamically stable post-CABG patients allocated equally to conventional cardiac rehabilitation or mindfulness-based therapy plus conventional rehabilitation. Outcomes were assessed before and after 8 weeks using the Illness Perception Questionnaire, Patient Health Questionnaire-9, HRQOL-14, blood pressure, and heart rate. Data were analysed using independent-samples t-tests, paired-samples t-tests, and Mann-Whitney U tests as appropriate. **Results:** Illness perception improved more in the combined-intervention group than in the conventional rehabilitation group, with post-treatment scores of  $21.54 \pm 2.65$  versus  $32.54 \pm 3.12$ , respectively ( $p < 0.001$ ). PHQ-9 scores were also lower after combined therapy than conventional rehabilitation alone ( $3.66 \pm 0.91$  vs  $5.91 \pm 0.82$ ;  $p < 0.001$ ). Several HRQOL-14 domains, post-treatment diastolic blood pressure, and heart rate also favoured the combined-intervention group. **Conclusion:** Mindfulness-based therapy added to conventional cardiac rehabilitation produced greater short-term improvement in illness perception, depressive symptoms, quality-of-life indicators, diastolic blood pressure, and heart rate than conventional rehabilitation alone. **Keywords:** Cardiac rehabilitation; Mindfulness-based therapy; Depression; Illness perception; PHQ-9; Health-related quality of life; CABG.

## INTRODUCTION

Cardiovascular disease remains a leading contributor to morbidity, mortality, impaired functional independence, and reduced quality of life worldwide. Cardiac rehabilitation is now recognized as an essential component of secondary prevention because it combines structured physical activity, cardiovascular risk reduction, education, counselling, symptom monitoring, and psychosocial support to improve recovery after cardiac events and surgical procedures. Contemporary evidence indicates that cardiac rehabilitation can reduce morbidity, mortality, unplanned hospital admissions, and cardiovascular risk burden while improving exercise tolerance, psychosocial well-being, and health-related quality of life; however, participation and implementation remain suboptimal in many clinical

settings despite strong recommendations for its routine use (1). The impact of cardiac disease extends beyond physiological impairment, as patients recovering from coronary events or cardiac surgery frequently experience fear, uncertainty, low confidence, depressive symptoms, and altered beliefs about illness and recovery, all of which may reduce rehabilitation engagement and delay return to daily activities (2).

Depression and psychological distress are particularly important in cardiac rehabilitation because they are associated with poorer prognosis, reduced treatment adherence, impaired self-management, and increased risk of adverse cardiovascular outcomes. Evidence from patients with coronary artery disease and myocardial infarction suggests that depressive symptoms are common after cardiac events and may contribute to higher mortality and poorer recovery trajectories (3). Although psychological interventions such as cognitive therapy and stress-management approaches have shown some benefit for depressive symptoms, the effects on cardiac outcomes remain variable, and methodological inconsistency across trials has limited routine incorporation of structured psychological interventions into rehabilitation pathways (4). This creates a practical need for safe, acceptable, low-cost interventions that can be integrated with conventional rehabilitation to address both psychological and functional recovery.

Illness perception is another clinically relevant construct in cardiac rehabilitation because it reflects how patients understand, emotionally respond to, and cope with their disease. Patients who perceive their illness as highly threatening, poorly controllable, or strongly disabling may experience greater distress, reduced confidence in physical activity, and weaker adherence to rehabilitation recommendations. The self-regulatory model proposes that patients form cognitive and emotional representations of illness, adopt coping strategies based on those representations, and continuously revise their beliefs according to symptom experience and treatment response (5). Therefore, improving illness perception during rehabilitation may support better engagement, reduce maladaptive fear, and enhance recovery-oriented behaviour, particularly among patients recovering from major cardiac procedures such as coronary artery bypass grafting.

Health-related quality of life is also a key outcome after cardiac disease because recovery cannot be evaluated only through physiological parameters. Quality of life reflects physical functioning, emotional well-being, social participation, perceived health status, and the ability to resume meaningful daily activities. Previous cardiac rehabilitation studies have shown that structured exercise, counselling, and supportive rehabilitation models can improve quality of life and psychological well-being in patients after myocardial infarction, acute coronary syndrome, revascularization, and other cardiac conditions (6). Nevertheless, conventional rehabilitation models may not fully address persistent depressive symptoms, illness-related fear, stress reactivity, and negative expectations about recovery, suggesting the need for adjunctive mind–body strategies within rehabilitation care.

Mindfulness-based stress reduction and related mindfulness-based therapies have gained attention as adjunctive interventions in chronic disease and cardiovascular rehabilitation because they target patients' relationship with distressing thoughts, bodily sensations, stress responses, and emotional reactions rather than focusing only on symptom elimination. Mindfulness practices commonly involve breath awareness, non-judgmental observation, acceptance, patience, and present-moment attention, which may reduce rumination, improve emotional regulation, and support adaptive coping during recovery (7). Prior evidence has reported positive associations between mindfulness and cardiovascular health, and systematic reviews have suggested beneficial effects of mindfulness-based interventions on psychological stress, depression, anxiety, and well-being (8,9). In cardiac populations, mindfulness-based interventions have shown potential for improving depressive symptoms, anxiety, emotional well-being, and health-related quality of life, although findings remain heterogeneous and additional clinical research is needed in rehabilitation-specific settings (10,11).

The rationale for combining mindfulness-based therapy with cardiac rehabilitation is clinically plausible because psychological distress, depressive symptoms, illness beliefs, autonomic arousal, and functional confidence may interact during recovery. Conventional rehabilitation can improve physical conditioning and cardiovascular risk management, while mindfulness-based therapy may enhance emotional regulation, illness acceptance, symptom awareness, and confidence in activity participation. Previous randomized and controlled studies have suggested that mindfulness-based or stress-management interventions may produce short-term psychosocial benefits when added to cardiac care, but there remains limited evidence from local rehabilitation settings, particularly among hemodynamically stable patients undergoing early post-CABG rehabilitation (12,13). Evidence from Pakistan has also shown that cardiac rehabilitation can improve health-related quality of life after myocardial infarction, supporting the feasibility and relevance of rehabilitation-based interventions in local clinical practice (14).

Despite the growing literature on cardiac rehabilitation and psychological interventions, limited research has specifically examined the effect of adding mindfulness-based therapy to conventional cardiac rehabilitation on illness perception, depressive symptoms, and health-related quality of life in patients enrolled in Phase I cardiac rehabilitation after CABG. This gap is important because early rehabilitation is a critical period during which patients develop beliefs about their illness, confidence in recovery, and willingness to participate in activity-based rehabilitation. Addressing maladaptive illness perception and depressive symptoms during this period may strengthen both psychological and functional recovery.

Therefore, this randomized controlled trial was designed using a PICO framework in which the population comprised hemodynamically stable post-CABG patients enrolled in Phase I cardiac rehabilitation; the intervention was conventional cardiac rehabilitation combined with mindfulness-based therapy; the comparator was conventional cardiac rehabilitation alone; and the outcomes were illness perception, depressive symptoms, health-related quality of life, blood pressure, and heart rate assessed before and after an 8-week intervention period. The objective of the study was to determine whether adding mindfulness-based therapy to conventional cardiac rehabilitation produces greater improvement in patients' perception of illness and depression than conventional cardiac rehabilitation alone. The study hypothesis was that patients receiving mindfulness-based therapy in addition to conventional cardiac rehabilitation would demonstrate greater improvement in illness perception, lower PHQ-9 depression scores, and better health-related quality-of-life indicators after treatment compared with patients receiving conventional cardiac rehabilitation alone.

## **MATERIALS AND METHODS**

This study was designed as a randomized controlled trial comparing conventional Phase I cardiac rehabilitation alone with conventional Phase I cardiac rehabilitation combined with mindfulness-based therapy among hemodynamically stable post-CABG patients. The study was conducted at the Punjab Institute of Cardiology, Lahore, after approval from the ethical committee of RCRS & AHS, and was completed within 10 months after synopsis approval. The trial included two parallel groups with equal allocation: Group A received conventional cardiac rehabilitation, and Group B received conventional cardiac rehabilitation combined with mindfulness-based therapy. The methodological structure was developed to evaluate whether the addition of mindfulness-based therapy produced greater improvement in illness perception, depressive symptoms, health-related quality of life, and selected physiological parameters than conventional rehabilitation alone.

The sample size was calculated using G\*Power software version 3.1.9.2 for comparison of two independent means between two groups, using PHQ-9 as the outcome basis from prior evidence. The calculation used a two-tailed test, 80% statistical power, and an allocation ratio of 1:1, with an estimated effect size of 0.9369779. The minimum calculated sample size was 44 participants, with 22 participants required in each group. To compensate for an anticipated 10% attrition rate, 48 participants were

recruited and allocated equally, with 24 participants in the conventional cardiac rehabilitation group and 24 participants in the mindfulness-based therapy plus rehabilitation group.

Participants were recruited through convenience sampling from patients attending Phase I cardiac rehabilitation after CABG who fulfilled the eligibility criteria. Eligible participants were then allocated to either treatment arm through simple randomization using sealed opaque envelopes labelled “0” for Group A and “1” for Group B. This approach separated the recruitment process from the allocation process, allowing eligible participants to be enrolled first and then assigned to either conventional rehabilitation or combined mindfulness-based therapy and rehabilitation. At the beginning of the intervention period, participants received a formal educational session of approximately 30 minutes delivered by the physiotherapist responsible for treatment and intervention procedures.

Participants were eligible for inclusion if they were male or female patients aged 40 to 65 years, were enrolled in Phase I rehabilitation after CABG, were hemodynamically stable, and had hypertension or diabetes mellitus. Patients were excluded if they were hemodynamically unstable, disoriented, dependent on a pacemaker, had uncontrolled arrhythmias, had orthopedic conditions such as fracture, had neuromuscular disease, or presented with red-flag symptoms including fever, night sweats, or malaise. These criteria were used to select patients who could safely participate in rehabilitation and mindfulness-based activities while reducing the risk of clinical instability or non-cardiac limitations affecting intervention participation.

Baseline assessment included demographic and anthropometric variables, physiological measures, illness perception, depressive symptoms, and health-related quality of life. Age was recorded in years, weight in kilograms, height in centimetres, and body mass index in kg/m<sup>2</sup>. Physiological monitoring included systolic blood pressure, diastolic blood pressure, and heart rate before and after treatment. Illness perception was assessed using the Illness Perception Questionnaire, which evaluates patients’ beliefs and emotional representations of illness within the self-regulatory model of health behaviour (15). Depressive symptoms were assessed using the Patient Health Questionnaire-9, a nine-item depression assessment tool in which higher scores indicate greater depressive symptom severity; commonly interpreted categories include minimal depression from 0 to 4, mild depression from 5 to 9, moderate depression from 10 to 14, moderately severe depression from 15 to 19, and severe depression from 20 to 27 (16). Health-related quality of life was assessed using the HRQOL-14 measure, which evaluates perceived health status and the number of physically or mentally unhealthy days and activity-limitation indicators over the relevant recall period (17).

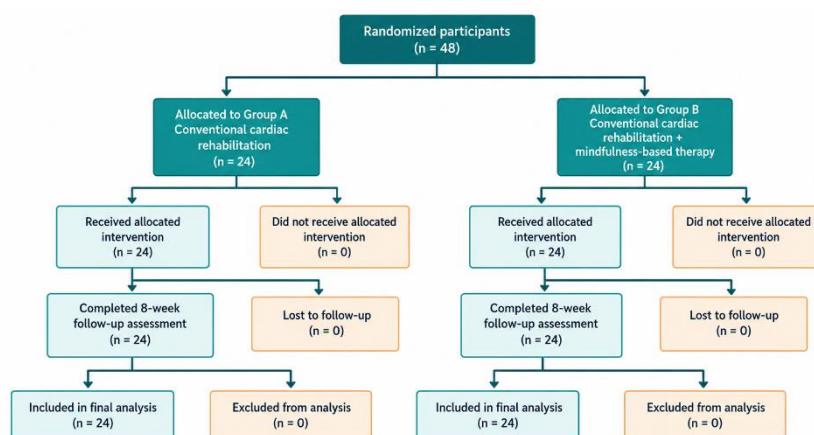


Figure 1 CONSORT Flowchart

Group A received conventional Phase I cardiac rehabilitation. This rehabilitation arm included standard physiotherapist-led rehabilitation care for post-CABG patients, with monitoring of blood pressure and heart rate and rehabilitation activities consistent with early cardiac rehabilitation practice. Group B

received the same conventional cardiac rehabilitation programme combined with mindfulness-based therapy. The mindfulness component focused on breath awareness, daily formal mindfulness practice, informal breathing awareness during the day, reflection on stress reactions, and cultivation of core mindfulness attitudes including non-judgment, patience, beginner's mind, trust, non-striving, acceptance, and letting be (18). Participants in the mindfulness-based therapy group were instructed to perform mindfulness-related practice as part of the 8-week intervention plan, while both groups continued their assigned rehabilitation protocol. Treatment evaluation was completed after 8 weeks using the same outcome measures recorded at baseline.

The primary outcome of the study was change in illness perception after the intervention period. Secondary outcomes included change in PHQ-9 depression score, HRQOL-14 indicators, systolic and diastolic blood pressure, and heart rate. Illness perception and depression were treated as continuous outcomes for comparison of pre-treatment and post-treatment mean scores. HRQOL-14 indicators were analysed using non-parametric methods because the data were not normally distributed. Physiological outcomes were summarized using mean and standard deviation before and after treatment in both groups.

Data were analysed using SPSS version 25. Data screening included assessment of normality using the Shapiro–Wilk test. Normally distributed continuous variables were summarized as mean  $\pm$  standard deviation, while non-normally distributed or ordinal variables were summarized using medians, mean ranks, and sums of ranks where appropriate. Independent-samples t-tests were used for between-group comparisons of normally distributed continuous outcomes, and paired-samples t-tests were used for within-group pre-treatment and post-treatment comparisons. Mann–Whitney U tests were used for between-group comparisons of HRQOL-14 variables when the distributional assumptions for parametric testing were not met. Statistical significance was evaluated using p-values, with values less than 0.05 considered statistically significant and values less than 0.001 reported as  $p < 0.001$  rather than  $p = 0.000$ .

To strengthen internal validity, the same baseline and post-treatment assessment framework was applied to both groups, eligibility criteria were used to reduce clinical heterogeneity, and standardized outcome instruments were used to measure illness perception, depression, and quality of life. The use of sealed opaque envelopes supported allocation concealment during group assignment, while equal group allocation minimized imbalance in participant numbers. Data integrity was maintained by recording baseline and post-treatment values using predefined outcome tools, applying the same assessment time points in both groups, and analysing all recruited participants who completed the intervention period. Ethical conduct was supported through prior ethical approval, recruitment of eligible and clinically stable participants, and consent before participation.

## RESULTS

A total of 60 patients were screened for eligibility, of whom 48 fulfilled the inclusion criteria and were randomized into two equal groups. Group A received conventional cardiac rehabilitation, while Group B received conventional cardiac rehabilitation combined with mindfulness-based therapy. Each group included 24 participants, and all randomized participants completed the 8-week intervention and were included in the final analysis. The final analysed sample therefore comprised 48 participants, with no reported attrition.

Table 1 presents the baseline demographic and anthropometric characteristics of both groups. Participants in Group A had a mean age of  $56.87 \pm 5.31$  years, while participants in Group B had a comparable mean age of  $56.37 \pm 6.76$  years, with a mean between-group difference of  $-0.50$  years. Mean body weight was also similar between Group A and Group B, at  $81.41 \pm 8.59$  kg and  $81.78 \pm 8.84$  kg, respectively. Group B had a slightly lower mean height than Group A, at  $154.70 \pm 10.20$  cm compared with  $158.60 \pm 9.04$  cm, and a higher mean BMI, at  $34.44 \pm 4.90$  kg/m<sup>2</sup> compared with  $32.44 \pm 3.30$  kg/m<sup>2</sup>.

These values indicate that both groups were broadly comparable at baseline, although BMI was numerically higher in the mindfulness-based therapy group.

**Table 1. Baseline Demographic and Anthropometric Characteristics of the Study Groups**

Variable	Group A: Conventional Cardiac Rehabilitation (n = 24), Mean ± SD	Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation (n = 24), Mean ± SD	Mean Difference
Age, years	56.87 ± 5.31	56.37 ± 6.76	-0.50
Weight, kg	81.41 ± 8.59	81.78 ± 8.84	0.37
Height, cm	158.60 ± 9.04	154.70 ± 10.20	-3.90
Body mass index, kg/m <sup>2</sup>	32.44 ± 3.30	34.44 ± 4.90	2.00

At baseline, illness perception and depressive symptom scores were comparable between groups, as shown in Table 2. The mean Illness Perception Questionnaire score was identical in both groups at baseline, with a mean score of 50.33 ± 4.55 in Group A and 50.33 ± 4.55 in Group B. The between-group mean difference was 0.00, with a 95% confidence interval from -2.64 to 2.64, indicating no baseline imbalance. PHQ-9 scores were also comparable at baseline, with Group A scoring 15.75 ± 2.17 and Group B scoring 16.25 ± 2.11. The mean baseline difference was 0.50 points, with a 95% confidence interval from -0.74 to 1.74 and p = 0.423, confirming no statistically significant baseline difference in depressive symptom severity.

**Table 2. Baseline Comparison of Primary Psychological Outcomes Between Groups**

Outcome	Group A: Conventional Cardiac Rehabilitation (n = 24), Mean ± SD	Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation (n = 24), Mean ± SD	Mean Difference	95% CI	Effect Size, Hedges g	p-value
Illness Perception Questionnaire score	50.33 ± 4.55	50.33 ± 4.55	0.00	-2.64 to 2.64	0.00	1.000
PHQ-9 score	15.75 ± 2.17	16.25 ± 2.11	0.50	-0.74 to 1.74	0.23	0.423

Table 3 shows the between-group comparison of illness perception before and after treatment. Both groups had identical baseline IPQ scores of 50.33 ± 4.55. After 8 weeks, Group A improved to 32.54 ± 3.12, whereas Group B improved to 21.54 ± 2.65. The post-treatment between-group mean difference was -11.00 points in favour of Group B, with a 95% confidence interval from -12.68 to -9.32 and a very large effect size of Hedges g = -3.74. This indicates that the addition of mindfulness-based therapy to conventional cardiac rehabilitation was associated with substantially greater improvement in illness perception than conventional rehabilitation alone.

**Table 3. Between-Group Comparison of Illness Perception Questionnaire Scores**

Time Point	Conventional Cardiac Rehabilitation (n = 24), Mean ± SD	Mindfulness-Based Therapy + Cardiac Rehabilitation (n = 24), Mean ± SD	Mean Difference	95% CI	Effect Size, Hedges g	p-value
Pre-treatment	50.33 ± 4.55	50.33 ± 4.55	0.00	-2.64 to 2.64	0.00	1.000
Post-treatment	32.54 ± 3.12	21.54 ± 2.65	-11.00	-12.68 to -9.32	-3.74	<0.001

The within-group pattern for illness perception is presented in Table 4. Group A showed a mean reduction of 17.79 points from baseline to post-treatment, while Group B showed a larger mean reduction of 28.79 points. Both within-group changes were statistically significant, with p < 0.001 in each group. The magnitude of reduction was therefore greater in the group receiving mindfulness-based therapy in addition to conventional rehabilitation, suggesting that the combined intervention produced stronger improvement in patients' cognitive and emotional perception of illness.

**Table 4. Within-Group Change in Illness Perception Questionnaire Scores**

Group	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	Mean Change	p-value
Group A: Conventional Cardiac Rehabilitation	50.33 ± 4.55	32.54 ± 3.12	-17.79	<0.001
Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation	50.33 ± 4.55	21.54 ± 2.65	-28.79	<0.001

Table 5 presents the between-group comparison of PHQ-9 depression scores. At baseline, Group A had a mean PHQ-9 score of 15.75 ± 2.17 and Group B had a mean score of 16.25 ± 2.11, with no statistically significant difference between groups. After 8 weeks, PHQ-9 scores decreased in both groups, but the reduction was greater in Group B. Group A improved to 5.91 ± 0.82, while Group B improved to 3.66 ±

0.91. The post-treatment mean difference was  $-2.25$  points in favour of Group B, with a 95% confidence interval from  $-2.75$  to  $-1.75$  and a large effect size of Hedges  $g = -2.56$ . These findings indicate that mindfulness-based therapy combined with cardiac rehabilitation was associated with significantly lower post-treatment depressive symptom scores compared with conventional cardiac rehabilitation alone.

**Table 5. Between-Group Comparison of PHQ-9 Depression Scores**

Time Point	Group A: Conventional Cardiac Rehabilitation (n = 24), Mean ± SD	Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation (n = 24), Mean ± SD	Mean Difference, Group B – Group A	95% CI for Mean Difference	Effect Size, Hedges g	p-value
Pre-treatment	15.75 ± 2.17	16.25 ± 2.11	0.50	-0.74 to 1.74	0.23	0.423
Post-treatment	5.91 ± 0.82	3.66 ± 0.91	-2.25	-2.75 to -1.75	-2.56	<0.001

Table 6 shows within-group changes in PHQ-9 scores. In Group A, the mean PHQ-9 score decreased from  $15.75 \pm 2.17$  at baseline to  $5.91 \pm 0.82$  after treatment, representing a mean reduction of 9.84 points. In Group B, the score decreased from  $16.25 \pm 2.11$  to  $3.66 \pm 0.91$ , representing a larger mean reduction of 12.59 points. Both within-group reductions were statistically significant at  $p < 0.001$ . Clinically, both groups improved from the moderately severe range toward lower depression severity, but the combined mindfulness-based therapy and rehabilitation group achieved the lower post-treatment PHQ-9 score.

**Table 6. Within-Group Change in PHQ-9 Depression Scores**

Group	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	Mean Change	p-value
Group A: Conventional Cardiac Rehabilitation	15.75 ± 2.17	5.91 ± 0.82	-9.84	<0.001
Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation	16.25 ± 2.11	3.66 ± 0.91	-12.59	<0.001

Table 7 presents HRQOL-14 Module 1 outcomes. Pre-treatment comparisons showed no statistically significant differences between the groups for general health rating, poor physical health days, poor mental health days, or days of activity restriction. After treatment, statistically significant between-group differences were observed across all four Module 1 indicators. Post-treatment general health rating showed a median of 50.00 in Group A and 75.00 in Group B, with markedly higher mean rank in Group B than Group A (36.50 vs 12.50;  $p < 0.001$ ). Post-treatment poor physical health days and poor mental health days also showed higher mean ranks in Group B than Group A, with  $p = 0.001$  and  $p = 0.004$ , respectively. Days of activity restriction differed significantly after treatment as well, with mean ranks of 21.00 in Group A and 28.00 in Group B and  $p = 0.005$ . These findings indicate greater post-treatment improvement in perceived health and activity-related quality-of-life indicators in the combined intervention group.

**Table 7. HRQOL-14 Module 1 Outcomes Between Groups**

Variable	Time Point	Group A Median	Group A Mean Rank	Group A Sum of Ranks	Group B Median	Group B Mean Rank	Group B Sum of Ranks	Z-value	p-value
General health rating	Pre-treatment	0.00	25.00	600.00	0.00	24.00	576.00	-1.000	0.317
	Post-treatment	50.00	12.50	300.00	75.00	36.50	876.00	-6.856	<0.001
Days of poor physical health	Pre-treatment	50.00	24.50	588.00	50.00	24.50	588.00	0.000	1.000
	Post-treatment	75.00	20.00	480.00	75.00	29.00	696.00	-3.293	0.001
Days of poor mental health	Pre-treatment	50.00	24.50	588.00	50.00	24.50	588.00	0.000	1.000
	Post-treatment	75.00	20.00	480.00	75.00	29.00	696.00	-2.893	0.004
Days of activity restriction	Pre-treatment	50.00	23.50	564.00	50.00	25.50	612.00	-0.628	0.530
	Post-treatment	75.00	21.00	504.00	75.00	28.00	672.00	-2.833	0.005

Table 8 shows HRQOL-14 Module 2 outcomes. No between-group difference was observed for limitation in any activity at baseline or after treatment, with identical median scores and mean ranks in both groups at both time points. Assistance in personal care was not significantly different at baseline, but became significantly different after treatment, with Group B showing a higher mean rank than Group A (28.00

vs 21.00; p = 0.017). Assistance in life routine did not differ significantly at baseline or post-treatment, with post-treatment p = 0.355. These results suggest that the combined intervention was associated with improvement in selected functional quality-of-life indicators, particularly personal-care-related independence, but not all HRQOL-14 Module 2 items demonstrated statistically significant between-group differences.

**Table 8. HRQOL-14 Module 2 Outcomes Between Groups**

Variable	Time Point	Group A Median	Group A Mean Rank	Group A Sum of Ranks	Group B Median	Group B Mean Rank	Group B Sum of Ranks	Z-value	p-value
Limitation in any activity	Pre-treatment	0.00	24.50	588.00	0.00	24.50	588.00	0.000	1.000
Limitation in any activity	Post-treatment	0.00	24.50	588.00	0.00	24.50	588.00	0.000	1.000
Assistance in personal care	Pre-treatment	100.00	22.50	540.00	100.00	26.50	636.00	-1.212	0.226
Assistance in personal care	Post-treatment	100.00	21.00	504.00	100.00	28.00	672.00	-2.379	0.017
Assistance in life routine	Pre-treatment	0.00	24.00	576.00	0.00	25.00	600.00	-0.590	0.555
Assistance in life routine	Post-treatment	0.00	23.00	552.00	0.00	26.00	624.00	-0.924	0.355

Table 9 presents HRQOL-14 Module 3 outcomes. Baseline comparisons were non-significant for pain-affected days, felt depressed days, anxious days, not-enough-sleep days, and full-energy days. After treatment, significant between-group differences were observed for all five indicators. Post-treatment pain-affected days showed higher mean rank in Group B than Group A (27.00 vs 22.00; p = 0.019). Felt depressed days, anxious days, and not-enough-sleep days each showed a post-treatment mean rank of 26.50 in Group B compared with 22.50 in Group A, with p = 0.039 for each comparison. Days of full energy showed the strongest Module 3 difference, with a median of 25.00 in Group A and 50.00 in Group B, mean ranks of 17.29 and 31.71, respectively, and p < 0.001. These findings indicate that the combined intervention was associated with broader improvement in emotional and energy-related quality-of-life domains after 8 weeks.

**Table 9. HRQOL-14 Module 3 Outcomes Between Groups**

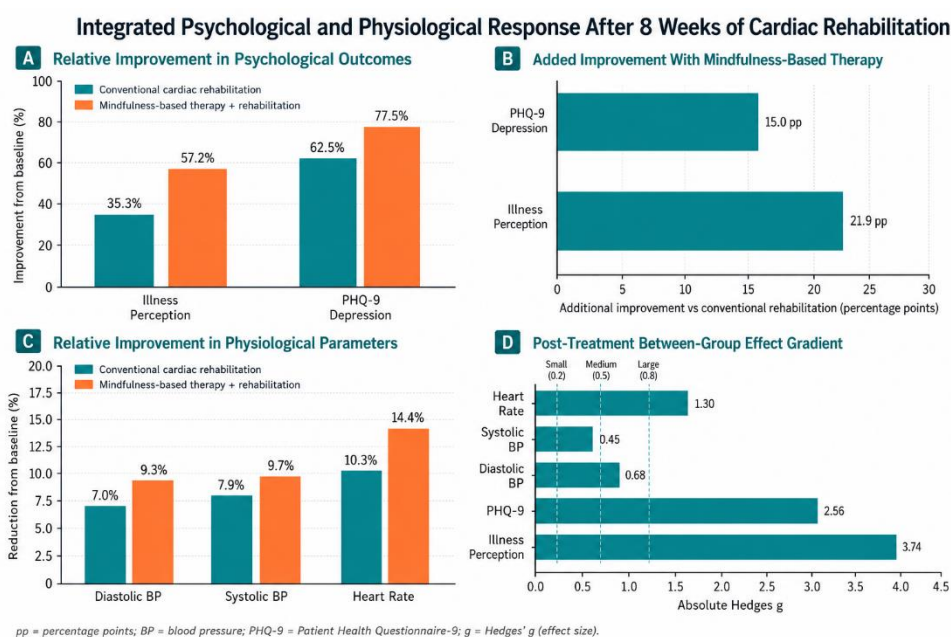
Variable	Time Point	Group A Median	Group A Mean Rank	Group A Sum of Ranks	Group B Median	Group B Mean Rank	Group B Sum of Ranks	Z-value	p-value
Days pain affected	Pre-treatment	50.00	24.00	576.00	50.00	25.00	600.00	-0.340	0.734
Days pain affected	Post-treatment	75.00	22.00	528.00	75.00	27.00	648.00	-2.338	0.019
Days felt depressed	Pre-treatment	50.00	24.50	588.00	50.00	24.50	588.00	0.000	1.000
Days felt depressed	Post-treatment	75.00	22.50	540.00	75.00	26.50	636.00	-2.067	0.039
Days anxious	Pre-treatment	50.00	24.00	576.00	50.00	25.00	600.00	-0.468	0.640
Days anxious	Post-treatment	75.00	22.50	540.00	75.00	26.50	636.00	-2.067	0.039
Days not enough sleep	Pre-treatment	50.00	23.50	564.00	50.00	25.50	612.00	-0.579	0.562
Days not enough sleep	Post-treatment	75.00	22.50	540.00	75.00	26.50	636.00	-2.067	0.039
Days full energy	Pre-treatment	25.00	24.00	576.00	25.00	24.00	552.00	0.000	1.000
Days full energy	Post-treatment	25.00	17.29	415.00	50.00	31.71	761.00	-4.423	<0.001

Table 10 presents pre-treatment and post-treatment blood pressure and heart rate values. Baseline systolic blood pressure was comparable between groups, with Group A showing 145.17 ± 9.97 mmHg and Group B showing 145.58 ± 9.39 mmHg. Baseline diastolic blood pressure was 94.33 ± 8.31 mmHg in Group A and 93.04 ± 7.15 mmHg in Group B. Baseline heart rate was numerically higher in Group A than Group B, at 100.00 ± 9.67 beats/minute compared with 96.63 ± 8.35 beats/minute, but this difference was not statistically significant. After treatment, both groups showed reductions in blood pressure and heart rate. Post-treatment diastolic blood pressure was significantly lower in Group B than Group A, with a mean difference of -3.33 mmHg and p = 0.021. Post-treatment heart rate was also significantly lower in Group B, with a mean difference of -6.96 beats/minute and p < 0.001. Post-treatment systolic blood pressure was numerically lower in Group B than Group A, but the between-group difference did not reach statistical significance.

**Table 10. Blood Pressure and Heart Rate Before and After Treatment**

Variable	Time Point	Group A: Conventional Cardiac Rehabilitation (n = 24), Mean ± SD	Group B: Mindfulness-Based Therapy + Cardiac Rehabilitation (n = 24), Mean ± SD	Mean Difference	95% CI	Effect Size, Hedges g	p-value
Diastolic blood pressure, mmHg	Pre-treatment	94.33 ± 8.31	93.04 ± 7.15	-1.29	-5.80 to 3.22	-0.16	0.567
Systolic blood pressure, mmHg	Pre-treatment	145.17 ± 9.97	145.58 ± 9.39	0.42	-5.21 to 6.04	0.04	0.882
Heart rate, beats/minute	Pre-treatment	100.00 ± 9.67	96.63 ± 8.35	-3.38	-8.63 to 1.88	-0.37	0.202
Diastolic blood pressure, mmHg	Post-treatment	87.71 ± 5.31	84.38 ± 4.25	-3.33	-6.13 to -0.53	-0.68	0.021
Systolic blood pressure, mmHg	Post-treatment	133.67 ± 4.42	131.46 ± 5.21	-2.21	-5.02 to 0.60	-0.45	0.120
Heart rate, beats/minute	Post-treatment	89.71 ± 6.06	82.75 ± 4.34	-6.96	-10.03 to -3.89	-1.30	<0.001

Overall, the results indicate that both conventional cardiac rehabilitation and combined mindfulness-based therapy with cardiac rehabilitation were associated with improvement over 8 weeks. However, the combined intervention group demonstrated greater post-treatment improvement in the primary psychological outcome of illness perception, with an 11.00-point lower post-treatment IPQ score than conventional rehabilitation alone. The combined intervention group also demonstrated significantly lower PHQ-9 depression scores after treatment, with a 2.25-point between-group advantage and a large effect size. HRQOL-14 findings showed statistically significant post-treatment differences across several general health, emotional health, sleep, pain, energy, and personal-care indicators, while physiological findings showed significantly lower post-treatment diastolic blood pressure and heart rate in the combined intervention group. These findings support the added short-term benefit of integrating mindfulness-based therapy with conventional cardiac rehabilitation for psychological recovery, quality-of-life improvement, and selected physiological outcomes in hemodynamically stable post-CABG rehabilitation patients.



**Figure 2 Integrated Psychological and Physiological Response After 8 Weeks of Cardiac Rehabilitation.**

The panelled figure demonstrates a consistent outcome gradient favouring mindfulness-based therapy combined with conventional cardiac rehabilitation over conventional rehabilitation alone. Illness perception improved by 57.2% in the combined-intervention group compared with 35.3% in the conventional rehabilitation group, producing an additional 21.9 percentage-point improvement and a very large post-treatment between-group effect (Hedges g = 3.74). PHQ-9 depression scores improved by 77.5% with combined therapy versus 62.5% with conventional rehabilitation, corresponding to an added 15.0 percentage-point improvement and a large post-treatment effect (Hedges g = 2.56). Physiological

responses also favoured the combined intervention, with greater reductions in diastolic blood pressure (9.3% vs 7.0%), systolic blood pressure (9.7% vs 7.9%), and heart rate (14.4% vs 10.3%). The largest treatment separation was observed for psychological recovery, while heart rate showed the strongest physiological between-group gradient, supporting the clinical relevance of adding mindfulness-based therapy to cardiac rehabilitation for short-term psychosocial and autonomic recovery.

## DISCUSSION

The present randomized controlled trial demonstrated that adding mindfulness-based therapy to conventional cardiac rehabilitation produced greater short-term improvement in illness perception, depressive symptoms, health-related quality of life indicators, and selected physiological parameters than conventional cardiac rehabilitation alone among hemodynamically stable post-CABG patients. Both groups improved after 8 weeks, indicating that conventional cardiac rehabilitation itself contributed meaningful benefit; however, the magnitude of improvement was consistently larger in the combined-intervention group. Illness perception improved from  $50.33 \pm 4.55$  to  $21.54 \pm 2.65$  in the mindfulness-based therapy group compared with  $50.33 \pm 4.55$  to  $32.54 \pm 3.12$  in the conventional rehabilitation group, producing an 11-point post-treatment between-group advantage. Similarly, PHQ-9 scores decreased from  $16.25 \pm 2.11$  to  $3.66 \pm 0.91$  in the combined-intervention group compared with  $15.75 \pm 2.17$  to  $5.91 \pm 0.82$  in the conventional rehabilitation group, indicating greater improvement in depressive symptom severity when mindfulness-based therapy was integrated into rehabilitation. These findings suggest that psychological recovery during cardiac rehabilitation may be strengthened when conventional exercise and education are combined with structured attention to stress regulation, breathing awareness, and adaptive illness-related cognition.

The improvement in illness perception is clinically important because patients' beliefs about disease controllability, consequences, emotional impact, and recovery expectations can influence rehabilitation adherence and functional confidence. A reduction in illness perception score in this study indicates a more favourable perception of the illness experience after treatment, and the larger reduction observed in the mindfulness-based therapy group suggests that patients may have developed better acceptance, reduced threat appraisal, and improved confidence in recovery. This is consistent with the theoretical basis of illness representation models, which propose that patients construct cognitive and emotional beliefs about illness and then use these beliefs to guide coping behaviour and treatment engagement. Within the context of cardiac rehabilitation, a less threatening and more adaptive illness perception may support participation in graded physical activity and reduce avoidance behaviour, particularly among patients recovering from CABG who may fear exertion, recurrent symptoms, or postoperative complications.

The reduction in depressive symptoms is also clinically meaningful. At baseline, both groups had PHQ-9 scores within the moderately severe range, whereas post-treatment scores shifted toward substantially lower symptom severity in both groups, with the lowest score observed in the mindfulness-based therapy group. This finding aligns with previous evidence showing that anxiety and depression are common in cardiac rehabilitation populations and may interfere with adherence, recovery, and long-term self-management (19). Psychological distress in cardiac patients is not merely an emotional consequence of disease; it may interact with health behaviour, inflammatory and autonomic mechanisms, sleep disturbance, fatigue, and motivation for activity, thereby affecting rehabilitation participation and perceived recovery (20). The greater PHQ-9 improvement in the combined-intervention group supports the role of mindfulness-based therapy as a potentially useful adjunct for addressing depressive symptoms during rehabilitation, particularly when delivered alongside conventional cardiac rehabilitation rather than as an isolated psychological intervention.

The present findings are consistent with previous work suggesting that mindfulness-based and stress-management interventions may improve psychological outcomes in cardiac populations. Prior cardiac

rehabilitation research has shown that stress, anxiety, and depression represent major challenges in cardiac recovery and that additional psychological support may be required beyond exercise-based rehabilitation alone (19). Evidence from cardiac rehabilitation cohorts has also indicated that comorbid psychological stress and depression are associated with poorer outcomes after rehabilitation, highlighting the need to address psychological distress as part of comprehensive care (20). In the present trial, the larger reduction in PHQ-9 scores in the mindfulness-based therapy group provides practical support for this integrated model, although the study did not measure long-term cardiac events, readmissions, or mortality and therefore cannot establish whether psychological improvement translated into improved cardiovascular prognosis.

The HRQOL-14 findings further support the added value of the combined intervention. Post-treatment differences favoured the mindfulness-based therapy group across general health rating, poor physical health days, poor mental health days, activity restriction, personal care, pain-affected days, depressed days, anxious days, sleep-related indicators, and full-energy days. The strongest quality-of-life separation appeared in general health rating and full-energy days, where post-treatment mean ranks were markedly higher in the combined-intervention group. These findings indicate that the benefits of mindfulness-based therapy were not limited to depression scores but extended across broader patient-perceived recovery domains. Such effects are plausible because mindfulness practices may reduce rumination, improve emotional regulation, increase tolerance of bodily sensations, and support more confident engagement with rehabilitation activities. Previous literature has similarly emphasized that depressive symptoms and health-related quality of life are closely linked in coronary heart disease, with poorer mental health associated with worse perceived functioning and recovery (21).

The physiological outcomes showed additional but more selective benefits. Both groups demonstrated reductions in systolic blood pressure, diastolic blood pressure, and heart rate after treatment, consistent with expected effects of cardiac rehabilitation and improved recovery. However, post-treatment diastolic blood pressure and heart rate were significantly lower in the mindfulness-based therapy group than in the conventional rehabilitation group, while the post-treatment systolic blood pressure difference did not reach statistical significance. This pattern suggests that the combined intervention may have had a favourable effect on autonomic regulation or stress-related physiological arousal, particularly reflected in heart rate reduction. Nevertheless, these findings should be interpreted cautiously because blood pressure and heart rate were secondary physiological indicators, and the study did not include ambulatory monitoring, biochemical stress markers, heart-rate variability, or long-term cardiovascular outcomes.

The magnitude of psychological change deserves careful interpretation. The between-group post-treatment effect sizes were large for illness perception and PHQ-9, suggesting a strong separation between groups after 8 weeks. However, very large effect sizes in small single-centre trials may be influenced by sampling variability, limited blinding, therapist-contact effects, baseline clinical homogeneity, and measurement context. The current findings therefore provide promising short-term evidence but should not be interpreted as definitive proof of long-term superiority. Future studies should confirm these results using larger multicentre samples, concealed computer-generated randomization, blinded outcome assessment, standardized intervention fidelity checks, and longer follow-up after discharge or rehabilitation completion.

The findings are clinically relevant because cardiac rehabilitation programmes often emphasize physical recovery while psychological distress, illness beliefs, sleep disturbance, and emotional adjustment receive less structured attention. The integration of mindfulness-based therapy may offer a practical, low-risk adjunct that can be delivered alongside rehabilitation sessions and supported through home practice. In this study, the combined intervention appeared to improve both psychological and perceived functional recovery without evidence of participant attrition. This supports feasibility, although

adherence data, session attendance, home-practice completion, adverse events, and therapist fidelity were not reported and should be included in future trials to strengthen reproducibility.

Several limitations must be acknowledged. The study was conducted at a single centre with a relatively small sample of 48 participants, which limits generalizability. Recruitment was based on convenience sampling before random allocation, which may introduce selection bias. The intervention was described as Phase I cardiac rehabilitation but was delivered over 8 weeks, so the exact rehabilitation phase, postoperative timing, and care setting require clearer definition. Blinding of outcome assessors was not reported, and therapist-contact time may have differed between groups because the experimental group received an additional mindfulness-based component. The study also included multiple HRQOL comparisons without adjustment for multiple testing, increasing the possibility of type I error. In addition, no long-term follow-up was conducted, and the study did not measure cardiac readmission, recurrent cardiac events, medication adherence, inflammatory markers, heart-rate variability, or mortality. Therefore, claims should remain restricted to short-term improvements in illness perception, depressive symptoms, health-related quality of life, blood pressure, and heart rate.

Overall, the results suggest that mindfulness-based therapy may be a valuable adjunct to conventional cardiac rehabilitation for improving short-term psychological and quality-of-life outcomes in stable post-CABG rehabilitation patients. The greatest benefit was observed in illness perception and depressive symptoms, with additional improvements in selected HRQOL indicators and physiological parameters. These findings support a more integrated rehabilitation model that addresses both physical and psychological recovery, while also indicating the need for more rigorous trials with long-term follow-up and standardized intervention reporting.

## CONCLUSION

Mindfulness-based therapy combined with conventional cardiac rehabilitation produced greater short-term improvement than conventional cardiac rehabilitation alone in illness perception, depressive symptoms, several health-related quality-of-life indicators, diastolic blood pressure, and heart rate among hemodynamically stable post-CABG patients after 8 weeks of intervention. The strongest treatment effects were observed for illness perception and PHQ-9 depression scores, suggesting that integrating mindfulness-based strategies into cardiac rehabilitation may enhance psychological recovery and patient-perceived health during early rehabilitation. However, because the study was single-centre, small in sample size, and limited to short-term outcomes, the findings should be interpreted as clinically promising but requiring confirmation through larger randomized trials with longer follow-up, standardized intervention fidelity, and assessment of cardiac readmission and other objective clinical outcomes.

## REFERENCES

1. Dalal HM, Doherty P, Taylor RS. Cardiac rehabilitation. *BMJ*. 2015;351.
2. Rao A, Zecchin R, Newton PJ, Phillips JL, DiGiacomo M, Denniss AR, et al. The prevalence and impact of depression and anxiety in cardiac rehabilitation: a longitudinal cohort study. *Eur J Prev Cardiol*. 2020;27(5):478-89.
3. Meijer A, Conradi HJ, Bos EH, Thombs BD, van Melle JP, de Jonge P. Prognostic association of depression following myocardial infarction with mortality and cardiovascular events: a meta-analysis of 25 years of research. *Gen Hosp Psychiatry*. 2011;33(3):203-16.
4. Whalley B, Thompson DR, Taylor RS. Psychological interventions for coronary heart disease: Cochrane systematic review and meta-analysis. *Int J Behav Med*. 2014;21(1):109-21.

5. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. *J Psychosom Res.* 2006;60(6):631-7.
6. Hisam A, Haq ZU, Aziz S, Doherty P, Pell J. Effectiveness of mobile health augmented cardiac rehabilitation (MCard) on health-related quality of life among post-acute coronary syndrome patients: a randomized controlled trial. *Pak J Med Sci.* 2022;38(3 Part I):716-23.
7. Kabat-Zinn J, Hanh TN. *Full catastrophe living: using the wisdom of your body and mind to face stress, pain, and illness.* New York: Delta; 2009.
8. Loucks EB, Britton WB, Howe CJ, Eaton CB, Buka SL. Positive associations of dispositional mindfulness with cardiovascular health: the New England Family Study. *Int J Behav Med.* 2015;22(4):540-50.
9. Goyal M, Singh S, Sibinga EMS, Gould NE, Rowland-Seymour A, Sharma R, et al. Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Intern Med.* 2014;174(3):357-68.
10. O'Doherty V, Carr A, McGrann A, O'Neill JO, Dinan S, Graham I, et al. A controlled evaluation of mindfulness-based cognitive therapy for patients with coronary heart disease and depression. *Mindfulness.* 2015;6(3):405-16.
11. Nyklíček I, Dijkstra SC, Lenders PJ, Fonteijn WA, Koolen JJ. A brief mindfulness based intervention for increase in emotional well-being and quality of life in percutaneous coronary intervention patients: the MindfulHeart randomized controlled trial. *J Behav Med.* 2014;37(1):135-44.
12. Nijjar PS, Connett JE, Lindquist R, Brown R, Burt M, Pergolski A, et al. Randomized trial of mindfulness-based stress reduction in cardiac patients eligible for cardiac rehabilitation. *Sci Rep.* 2019;9(1):18415.
13. Blumenthal JA, Sherwood A, Smith PJ, Watkins L, Mabe S, Kraus WE, et al. Enhancing cardiac rehabilitation with stress management training. *Circulation.* 2016;133(14):1341-50.
14. Ul-Haq Z, Khan D, Hisam A, Yousafzai YM, Hafeez S, Zulfiqar F, et al. Effectiveness of cardiac rehabilitation on health-related quality of life in patients with myocardial infarction in Pakistan. *J Coll Physicians Surg Pak.* 2019;29(9):803-9.
15. Broadbent E, Wilkes C, Koschwanez H, Weinman J, Norton S, Petrie KJ. A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. *Psychol Health.* 2015;30(11):1361-85.
16. Martin A, Rief W, Klaiberg A, Braehler E. Validity of the brief Patient Health Questionnaire mood scale in the general population. *Gen Hosp Psychiatry.* 2006;28(1):71-7.
17. Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's Healthy Days Measures: population tracking of perceived physical and mental health over time. *Health Qual Life Outcomes.* 2003;1:37.
18. Bishop SR. What do we really know about mindfulness-based stress reduction? *Psychosom Med.* 2002;64(1):71-83.
19. Chauvet-Gelinier JC, Bonin B. Stress, anxiety and depression in heart disease patients: a major challenge for cardiac rehabilitation. *Ann Phys Rehabil Med.* 2017;60(1):6-12.
20. Kachur S, Menezes AR, De Schutter A, Milani RV, Lavie CJ. Significance of comorbid psychological stress and depression on outcomes after cardiac rehabilitation. *Am J Med.* 2016;129(12):1316-21.

21. Ruo B, Rumsfeld JS, Hlatky MA, Liu H, Browner WS, Whooley MA. Depressive symptoms and health-related quality of life: the Heart and Soul Study. *JAMA*. 2003;290(2):215-21.
22. Celano CM, Daunis DJ, Lokko HN, Campbell KA, Huffman JC. Anxiety disorders and cardiovascular disease. *Curr Psychiatry Rep*. 2016;18(11):101.
23. Beach SR, Januzzi JL, Mastromauro CA, Healy BC, Beale EE, Celano CM, et al. Patient Health Questionnaire-9 score and adverse cardiac outcomes in patients hospitalized for acute cardiac disease. *J Psychosom Res*. 2013;75(5):409-13.
24. Kroenke K, Spitzer RL, Williams JBW, Löwe B. The Patient Health Questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. *Gen Hosp Psychiatry*. 2010;32(4):345-59.