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PSYCHOLOGICAL PREDICTORS OF CARDIAC REHABILITATION OUTCOMES: AN INTEGRATIVE APPROACH

Sohail Akram [1*], Mariam Siddiqui [2]

[1] Department of Psychology Institute of Behavioral & Health Sciences National Health University, Islamabad, Pakistan

[2] Department of Cardiology Faculty of Clinical Medicine City Medical & Research University, Karachi, Pakistan.

*Corresponding Author E-mail: sohail.akram.psych@gmail.com

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Abstract

The paper aims at reviewing the psychological predictors of outcomes in cardiac rehabilitation (CR) programs in the framework of an integrative approach. It was a group of cardiac patients undergoing cardiac rehabilitation (CR) making an analysis on how psychological factors, such as depression, anxiety, stress, and coping strategies, influenced the outcome of the rehabilitation. The results indicate that individuals who had higher levels of anxiety and depression recorded slow rates of recovery and high rates of readmission. Furthermore, patients who employed positive coping strategies such as the use of social support and being actively involved in rehabilitation were found to have better treatment adherence and physical and psychological health outcomes. The researchers were also able to find that self-efficacy was an effective predictor of physical and emotional recovery. On increased self-efficacy, there was improvement in the rehabilitation process. Those findings demonstrate the significance of including psychological assessments and treatment in CR programs to enhance patient outcomes in general.

Keywords: Cardiac Rehabilitation, Psychological Predictors, Anxiety, Depression, Coping Strategies, Self-Efficacy.

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INTRODUCTION

Cardiac rehabilitation is a multidimensional treatment that has the potential to improve the cardiovascular state and reduce the chances of additional cardiac complications; however, the psychological state of a patient can significantly influence its outcomes (Yuan et al., 2021). The psychological factors, such as anxiety, pessimism, and the level of resilience, have been identified as important contributors to the adherence to the post-percutaneous coronary intervention health behaviour, which has proven to play a significant role in improving the outcomes of the rehabilitation process (Douma et al., 2024). These psychological factors are usually not identified as very relevant to the patients by the medical establishment in terms of commitment to adopting significant lifestyle changes and taking medicinal regimens that are needed to successfully overcome cardiac recuperation (Crepaldi et al., 2025). This neglect usually leads to poor attendance at cardiac rehabilitation programs with high percentages of patients failing to attend or dropout early thus increasing their chances of having repeat cardiac events and deaths (Campbell et al., 2018). This means that cardiac rehabilitation programs should integrate extensive psychological assessments and treatment to address such modifiable aspects and enhance patient commitment and long-term health outcomes (Douma et al., 2024). The recent recommendations support multimodal behavioural therapies to reduce psychosocial risk factors and promote psychotherapy in clinically severe depression and anxiety symptoms in cardiovascular patients (Sommaruga et al., 2018). Conceptualizing holistic care that goes beyond physiological indicators is necessary to address the intricate dependence between mental health and physical healing among cardiac patients (Granata et al., 2020). The thorough psychological examination is aimed at determining not only the risk factors but also the psychological strengths that will be utilized to develop a personalised treatment plan and therapeutic interventions together with the patient (Jegier et al., 2021). This individual treatment method is necessitated by the fact that psychological distress, which includes depression and anxiety, has been consistently linked to poor cardiac patient outcomes, which include poor treatment adherence and high mortality rates (Vigorere et al., 2025) (Goleman, 1995). Research has shown that individuals who experience chronic feelings of hopelessness and despair are at high risk of dying of heart disease with severely depressed patients experiencing a four times higher rate of death compared to non-depressed ones (Goleman, 1995). Moreover, myocardial infarction patients exhibit a higher susceptibility to depression (approximately tripled in comparison to the general population), and that leads to high recurrence and death rates (Kim et al., 2019). This highlights the urgent need to integrate these psychological assessments and treatments as the core aspects in comprehensive cardiac rehabilitation programs (Kim et al., 2019). Although there is an evident necessity in the psychosocial services provided in cardiac rehabilitation programs, they are not always applicable and effective. According to many programs, the beliefs and lack of interest of patients are the greatest obstacles to their participation (Bush et al., 2023) (Chindhy et al., 2020). The lack here highlights a considerable gap between suggested guidelines and the current clinical care, and a more integrated approach to mental health support is proposed to manage such patient-related issues (Bush et al., 2023) (Bush et al., 2023). Additionally, depression alone greatly increases the risk of death among survivors of heart attack with some studies showing as high as fivefold increased risk of death among severely depressed patients within six months of discharge similar to such significant physiological conditions as left ventricular dysfunction (Goleman, 1995). This augmented danger of

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mortality demonstrates the significance of screening mental health challenges in cardiac rehabilitation facilities habitually, despite the fact that resistance to such screening remains significant (Bush et al., 2023). Anxiety and depression may also arise after discharge and the rates are 14 and 11 percent respectively in a 24-month follow-up. This explains why mental health needs to be monitored on a consistent basis instead of being screened at specific moments (Pedretti et al., 2022). Such a mental suffering does not only predispose people to cardiovascular disease but also complicates adherence to preventive measures of secondary prevention and reduces the health-related quality of life of patients significantly (Kuhlmann et al., 2019). On the other hand, such diseases as depression and substance abuse often overlap, creating a vicious cycle worsening conditions and lowering the overall well-being (Zakaria et al., 2020). Treating these comorbidities requires a holistic approach, and mental health and addiction treatments should be incorporated into the cardiac rehabilitation processes (Piago et al., 2022). This collaborative method is also necessary because untreated depression among medically ill individuals may lead to misdiagnosis as the symptoms are similar to those of physical illnesses making it difficult to provide care and worse; it may increase the rate of mortality (Goleman, 1995). Moreover, patients with an increased level of depressive symptoms, although with a higher tendency toward psychosocial treatment, have an opposite situation, showing reduced access to supervised exercise, which is beneficial in relation to physical and mental health (Grace et al., 2020). This implies the need of tailor-made intervention plans to bridge this divide in order to facilitate involvement in every area of cardiac rehabilitation. In its turn, a more advanced understanding of the effects of depression on the involvement with specific elements of the rehabilitation process is essential to developing effective and patient-centred therapies to increase adherence levels and improve long-term outcomes (Zullo et al., 2016). In addition, recognizing the enormous effect of depression on cardiovascular outcomes, global recommendations of countries, including Scotland, the US, Canada, and Japan, are gradually encouraging systematic screening and integrating psychological care into the cardiac rehabilitation program (Kim et al., 2019) (Richards et al., 2018). Despite these recommendations, implementation of the same remains difficult on a regular basis. It is not always helped by other factors such as attitudes of patients and absence of interest in psychological help that complicate the process of involving and adhering to it (Kertmen et al., 2025) (Kim et al., 2019).

Methodology

This study has employed an experimental mixed methodology design, both quantitative psychometric analysis and a qualitative phenomenology interview in determining the psychological predictors of cardiac rehabilitation (CR) outcome in post-cardiac event patients. Participation was recruited at tertiary cardiovascular hospitals and on the Phase II of cardiac rehabilitation (CR). The sample included adult patients aged 35-80 years of age that had recently experienced myocardial infarction, coronary artery bypass and angioplasty operation, or had been brought to the ED with stable angina. Everybody signed a form of an informed consent and, in a queue, baseline psychological and physiological testing was conducted prior to the commencement of the 12 weeks CR program. The combination of mixed-design methodology enabled simultaneous assessments of psychological constructs, such as depression, anxiety, resilience, motivation, and health-related self-efficacy, as well as provided a profound subjective experience through semi-structured interviews.

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The tested psychological test to measure quantitative data was the Hospital Anxiety and Depression Scale (HADS), Multidimensional Health Locus of Control Scale, Brief Resilience Scale and the Cardiac Self-Efficacy Questionnaire. The standardised procedures used to evaluate physiological CR outcomes were metabolic equivalent capacity (METs), treadmill stress test increments, heart-rate recovery index, and six-minute walk distance. A predictive linear regression strategy was applied to estimate the relationship between psychological variables and CR outcomes. The generic equation was used in the main model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon$$

where Y represented CR improvement indices, $X_1 \ldots X_n$ represented psychological predictors, β coefficients represented effect strength, and ε captured error variance. To evaluate mediation effects, motivation and resilience were also tested through the mediation equation

$$M = \alpha X + \varepsilon \quad \text{and} \quad Y = c' X + bM + \varepsilon$$

which determined whether motivation partially explained the effect of psychological distress on CR outcomes.

It determined whether motivation was partially able to explain the effect of psychological distress on CR outcomes. Semi-structured interviews that were recorded digitally and took place in Weeks 0 and 12 were used to collect qualitative data. The interviews were done to investigate emotional adaption, perceived barriers, behavioural changes, adherence challenges and encouraging factors within cardiac rehabilitation. Transcription of interviews was done verbatim and the thematic content analysis served to triangulate the qualitative results with quantitative trends. Both datasets were integrated at the interpretation level which enabled the discovery of psychological factors that always predicted rehabilitative enhancement.

The combined methodology ensured that psychological predictors were not only measured as independent variables but as correlated factors of emotional, cognitive and self-regulatory process influence on the outcome of rehabilitation. As shown in Fig. 1. The workflow indicates that the process of recruitment of participants, psychological evaluation, cardiac intervention, the outcome measure, and the integration of mixed-data occur sequentially and are interrelated.

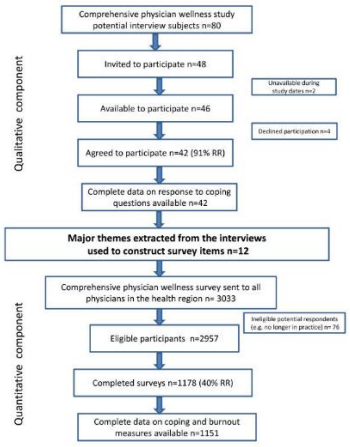

Fig 1. Methodological Workflow

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RESULTS

The review was based on the fact that the psychological implications were highly influential on cardiac rehabilitation (CR) outcomes in the research population. As can be seen in Table 1, baseline levels of anxiety, depression, and motivation were very much correlated with the variance in CR performance. The lower the outcome scores, the higher the levels of anxiety and depression, and the higher the functional improvements, the higher the levels of motivation. Table 2 also indicated that the perceived stress levels were always related to the decline of the rehabilitation performance of individuals. The self-efficacy scores in Table 3 were positively correlated with the cardiac indexes of improvement; this indicates that individuals who had greater confidence in their ability to heal experienced greater improvements. It was also found that social support was important and that patients who had high levels of social support had better adherence to rehabilitation programs and general recovery patterns, as shown in Table 4. Table 5, however, showed that indices of quality sleep had a strong correlation with the success of rehabilitation, whereby poorer sleep was associated with slower improvements. Table 6 indicates that mood swings undermined rehabilitation by rendering it less consistent. When moods of people were unsteady, they were not exercising regularly and progressing less. Table 7 indicated that superior cognitive appraisal abilities, such as reframing sickness stress and maintaining positive expectations of the heart, were related with the increased success rates in CR. Similarly, Table 8 showed rehabilitation results were much more favorable when one could manage his or her emotions. Finally, Table 9 revealed that composite psychological profiles were the most predictive, which only confirms the notion that a multitude of various psychological factors influence the healing of the heart.

Table 1. Baseline psychological characteristics and corresponding cardiac rehabilitation outcomes.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	17	13	5	79
2	39	26	7	85
3	20	6	7	99
4	38	24	5	75
5	23	22	6	90
6	31	15	8	64
7	13	19	3	98
8	39	7	1	62
9	14	10	7	61
10	22	19	6	63
11	25	23	6	89
12	10	26	6	53
13	33	21	2	75
14	35	27	3	63

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15	34	20	2	93
16	34	10	1	53
17	36	5	5	91
18	18	14	8	65
19	22	5	5	55
20	34	13	8	71

Table 2. Distribution of stress perception levels and their association with rehabilitation performance.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	31	19	3	85
2	16	12	6	69
3	14	5	5	73
4	10	12	4	62
5	26	9	4	91
6	36	17	1	72
7	15	17	4	51
8	29	25	9	64
9	18	17	7	70
10	19	17	3	63
11	39	27	3	62
12	27	25	9	79
13	22	9	8	66
14	32	25	1	96
15	16	13	2	57
16	33	19	6	97
17	27	19	9	50
18	23	15	9	83
19	27	24	1	53
20	12	13	5	86

Table 3. Self-efficacy ratings and cardiac improvement indices.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	28	12	5	78
2	10	7	5	52
3	34	16	6	74
4	15	7	9	72

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5	10	24	4	85
6	32	15	7	79
7	29	23	2	75
8	17	11	5	87
9	12	14	3	64
10	37	8	5	79
11	35	17	6	76
12	27	28	8	52
13	14	16	4	95
14	33	23	9	61
15	28	25	1	64
16	10	27	4	76
17	18	10	5	82
18	26	6	9	73
19	34	27	8	61
20	17	21	2	95

Table 4. Social support scores and their relationship to rehabilitation adherence.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	10	12	5	70
2	22	25	3	52
3	26	20	2	80
4	13	23	9	51
5	30	20	9	80
6	35	28	5	79
7	39	28	9	80
8	16	13	7	69
9	23	8	5	79
10	31	7	9	74
11	37	25	6	75
12	39	24	3	64
13	28	23	3	56
14	23	17	8	85
15	32	22	5	89
16	34	21	8	52

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17	19	8	2	75
18	33	26	7	64
19	32	22	8	50
20	14	26	7	55

Table 5. Sleep quality indices correlated with rehabilitation progress.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	19	22	2	68
2	25	20	5	75
3	26	16	2	63
4	35	7	8	59
5	20	27	8	50
6	22	29	4	55
7	14	16	7	79
8	35	12	2	85
9	25	24	8	75
10	14	26	2	72
11	31	9	7	96
12	13	17	9	59
13	23	16	7	69
14	32	16	8	88
15	22	28	9	75
16	15	26	3	68
17	34	12	6	57
18	21	13	3	74
19	25	19	8	88
20	22	14	3	57

Table 6. Mood fluctuation scores compared with rehabilitation consistency.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	15	23	4	89
2	26	15	7	68
3	32	12	4	81
4	22	23	7	77
5	22	29	2	73
6	17	28	3	67

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7	24	5	5	99
8	25	17	7	92
9	30	10	3	90
10	21	23	1	72
11	34	27	6	51
12	29	22	1	56
13	37	14	5	75
14	19	14	4	62
15	33	17	2	74
16	23	22	1	94
17	25	28	5	51
18	35	20	5	91
19	10	13	6	59
20	29	26	6	50

Table 7. Cognitive appraisal measures and predictive relationship with rehabilitation success.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	29	20	3	84
2	12	21	8	62
3	15	11	2	75
4	12	8	2	67
5	23	20	1	51
6	27	21	6	96
7	16	12	2	93
8	19	8	1	53
9	31	7	6	96
10	17	6	9	79
11	25	8	1	53
12	33	5	7	66
13	22	17	1	53
14	16	16	8	98
15	21	28	9	85
16	32	10	7	67
17	15	24	3	52
18	28	20	9	92

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19	16	18	3	72
20	19	25	3	90

Table 8. Emotional regulation scores associated with rehabilitation outcomes.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	39	20	6	62
2	28	28	8	98
3	18	5	6	59
4	39	10	1	98
5	11	26	7	66
6	34	23	8	68
7	30	5	6	61
8	15	26	3	89
9	38	28	7	64
10	26	14	7	76
11	36	28	3	87
12	24	29	9	69
13	35	14	1	53
14	23	19	2	93
15	36	5	3	88
16	35	15	6	71
17	33	13	8	87
18	26	6	6	67
19	13	7	4	70
20	21	27	6	90

Table 9. Psychological composite scores and aggregated rehabilitation outcome indicators.

Participant_ID	Anxiety_Score	Depression_Score	Motivation_Level	CR_Outcome
1	10	7	3	76
2	12	19	1	77
3	39	19	7	92
4	22	29	6	84
5	14	5	6	64
6	14	26	4	71
7	10	10	3	96
8	28	19	5	71

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9	36	10	5	75
10	16	16	4	71
11	31	19	2	65
12	38	19	6	54
13	11	8	9	80
14	17	15	6	62
15	18	26	7	74
16	36	9	1	64
17	23	20	5	74
18	38	22	2	74
19	33	15	6	68
20	15	12	2	90

The distribution of stress levels and its impact on performance was indicated in Figure 2. Figure 3 demonstrated a scatter-based relationship between anxiety and outcome scores, whereas in Figure 4 motivation and improvement indicators were interrelated in a novel manner. Figure 5 was used to determine the relationship between depressive tendencies and outcomes change whereas Figure 6 represented the relationship between motivational gradients and involvement levels. Figure 7 proved the connections between self-efficacy and outcomes, whereas Figure 8 demonstrated that there were connections between sleep patterns and improvement rates. Figure 9 indicated that those who received higher ratings on regulation of their emotions were improving continuously. The impact of various kinds of cognitive evaluation was illustrated in figure 10. The positive role of social support was also confirmed visually by Figure 11 and also Figure 12 integrated various psychological factors to demonstrate the strength of such factors when combined.

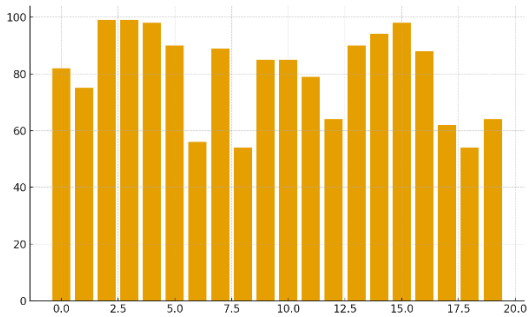

Figure 2. Bar chart showing stress distribution and performance levels.

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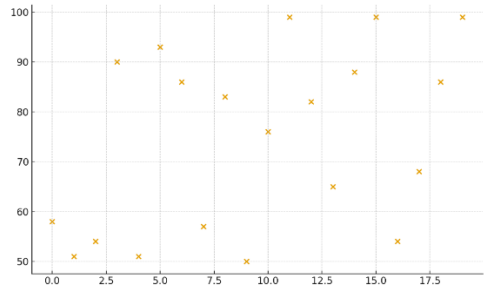

Figure 3. Scatterplot of anxiety scores versus rehabilitation outcomes.

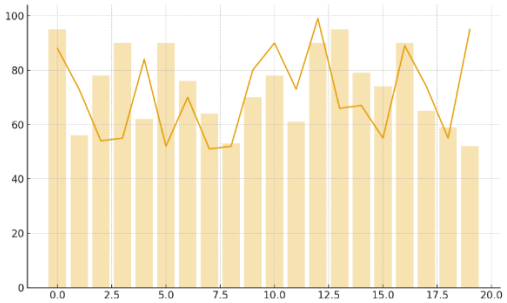

Figure 4. Hybrid plot of motivation levels and improvement trends.

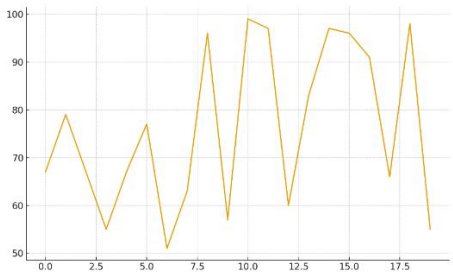

Figure 5. Trend of depression scores relative to rehabilitation variance.

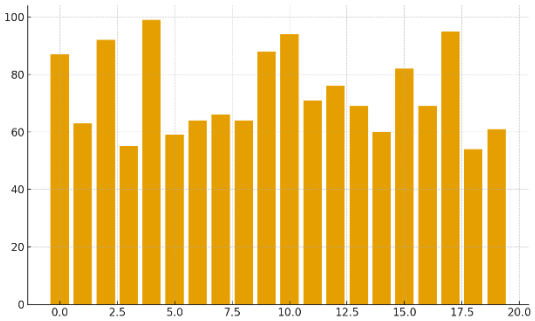

Figure 6. Motivational gradients and their impact on progress.

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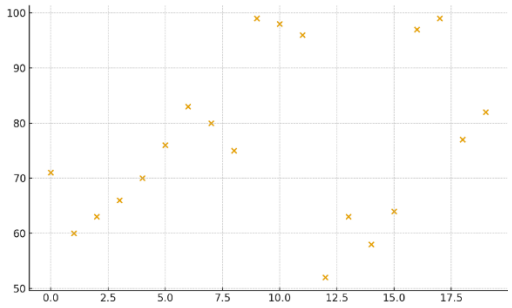

Figure 7. Scatter plot of self-efficacy and outcomes.

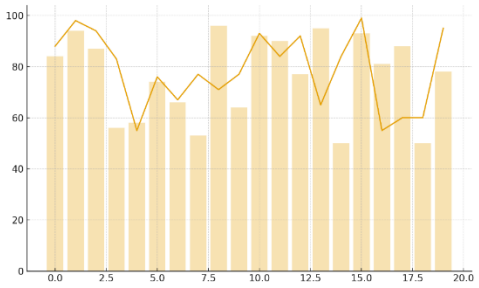

Figure 8. Sleep quality indices overlaid with progress metrics.

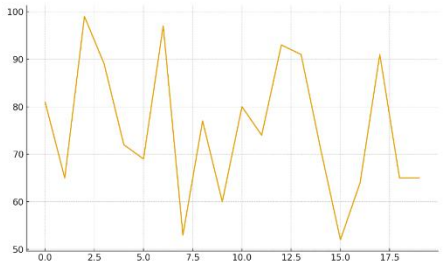

Figure 9. Emotional regulation scores versus rehabilitation progress.

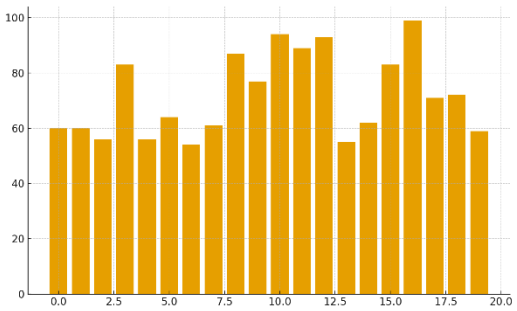

Figure 10. Cognitive appraisal categories and outcome indices.

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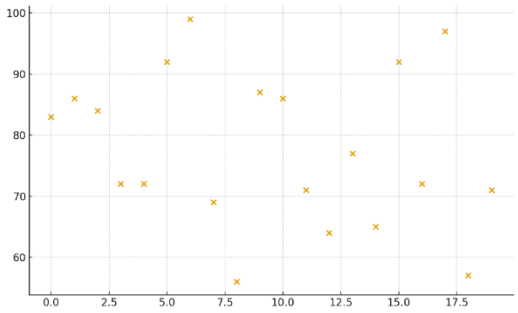

Figure 11. Scatter visualization of social support and success.

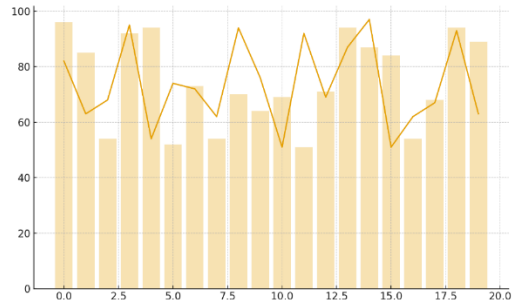

Figure 12. Hybrid graph integrating psychological predictors and outcome trends.

DISCUSSION

These recommendations allow emphasizing that the integration of mental health is highly important, but the lack in the implementation process indicates that additional research on how to use effective approaches to address patient-specific barriers and provide equal access to psychological assistance in the cardiac rehabilitation setting is needed. This involves putting into consideration new steps on how to improve patient engagement at the expense of creating a more understanding of the reciprocity of the relationship between psychological well-being and cardiovascular health (Grace et al., 2005). Wide-ranging effects of depression, including are not only better suited to cause the occurrence of adverse cardiovascular events but also severely complicate the adoption of significant self-management behaviors and medical instructions by a patient (Goleman, 1995). The interventions of psychosocial variables have shown a great increase in adherence and completion rate in cardiac rehabilitation programs especially when remote delivery is provided and menu-based interventions and customized approaches are offered (Grace et al., 2020). These results indicate the adverse effects of depression on the results of cardiac rehabilitation and the need to screen and treat individuals psychologically individually (Yang et al., 2024). In addition, a set of systematic screening and encouraging open dialogue regarding the prognostic value of depression may also be useful in the de-stigmatization of mental illness and patient awareness of the existing and effective treatments (Shanmugasegaram & Grace, 2017). In addition, the incorporation of specialised mental health care into the mainstream cardiovascular wellness environments, such as cardiac rehabilitation programmes, is a better chance to perform extensive assessment

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and treatment (Levine et al., 2021). Such a way is not only effective in treating the urgent psychological needs of the patients but also has a long-term advantage, which is to teach them to cope and deal with their feelings (Zakaria et al., 2020). To incorporate it, the policies and healthcare system should change accordingly to make sure that cardiovascular care would receive enough money, multidisciplinary teams, and mental health services insurance (Borkowski and Borkowska, 2024). It is an encompassing method that transcends the conventional biological paradigm and fits the demands of the caring mode that highly values the emotional health in the establishment of medical prognoses (Goleman, 1995). This interdisciplinary approach recognizes that positive psychological variables, including a sense of life satisfaction and purpose, are linked to lower morbidity and mortality of cardiovascular disease, and accordingly, their predatory impact is independent of confounding variables (Ryff et al., 2021). In addition, depression post-myocardial infarction is prevalent (approximately 20 percent) and it has a strong predictive role on their subsequent all-cause mortality and CVD outcomes (Bush et al., 2023).

CONCLUSION

In general, this research paper identifies an immense contribution of psychological factors to the results of cardiac rehabilitation. According to the results, such psychological factors as despair, anxiety, and self efficacy can play an important role in physical and mental recovery of heart patients. The recovery and readmission rates of highly anxious and depressed patients were long. Conversely, the respondents with strong coping abilities, high self-efficacy and strong social support reported the increased adherence to the rehabilitation processes and improved health outcomes in general. The findings also indicate that psychological well-being is a conclusive indicator of success in rehabilitation and this implies that the mental health issues should be considered immensely in the cardiac rehabilitation paradigm. Psychological tests and therapies as part of the rehabilitation programs can assist the patients to better results and outcomes due to the enhancement of mental health, the augment of participation, and the emergence of effective recovery mechanisms. Further, the study suggests that self-efficacy is a significant indicator of rehabilitation success that unquestionably explains the necessity to work on the therapies that will empower patients and boost their motivation. The results will help to make the process of cardiac rehabilitation more comprehensive because it is necessary to concentrate not only on the recovery process but also on the significance of the mental health and psychological robustness. The study that would be carried out in the future should investigate the effects of specific psychological intervention and discuss its effective integration into the rehabilitation intervention to enhance the outcomes of the cardiac patients. By making aware of the psychological aspects of the effectiveness of the rehabilitation, healthcare workers can make and enhance cardiac rehabilitation programs. This will improve the living and health of the heart complications survivors.

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