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A Resilience Bundle in Improving Quality of Life for Patients with Cardiac Surgery

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ABSTRACT

Background: Patients with cardiac surgery commonly experience physical and mental troubles after discharge from hospital and these complaints may significantly reduce quality of life. Currently, there is an increasing interest in modulating psychological factors as a means of enhancing surgical outcomes.

The aim of this study is to evaluate resilience bundle's effect on quality of life for patients with cardiac surgery.

Research design: A Quasi-Experimental research design was used.

Subjects and Methods: A purposive sample of forty patients with cardiac surgery selected from cardiac outpatient clinic at Zagazig university hospitals.

Two tools were used; an interview questionnaire for the studied patients and WHO Quality of Life Scale-Brief (WHOQOL-Brief).

Results: revealed that 85% of the studied patients were males, more than 40 years, married, educated, and living with their families. In the post- and follow-up phases of the intervention, most (92.5% & 90.0% respectively) of the studied subjects had satisfactory total knowledge level regarding cardiac surgery. Findings of the current study indicated statistically significant improvement among patients with cardiac surgery in QoL (80.0% & 85.0% respectively of studied subjects had good QoL) after implementation of resilience bundle as there were high differences in the mean scores of items throughout the study phases ($p< 0.001$).

Conclusion: Studied patients showed significant improvement in quality of life after practicing resilience bundle.

Recommendations: Similar study can be repeated by increasing sample size and possibly a trans-national study in order to further examine dependability of these results and generalizability.

Key words: Effect, Resilience bundle, Quality of life, and Cardiac surgery.

Introduction

Cardiac surgery is a common treatment approach and a universally approved intervention for cardiovascular diseases (CVDs) with nearly 1.5 million surgeries performed every year around the world **(Tai et al., 2021).** However, there is a scarcity of information in Egypt regarding the pattern of risk variables for patients having CABG surgery **(Reda et al., 2019).** Although cardiac surgery has positive therapeutic outcomes

on patients, helps them live better and getting back to their regular routines, patients may experience physical, mental, and social problems for several months following the procedure **(Ozcan et al., 2018).**

After cardiac surgery, patients commonly experience consequences as pain, distress, depressive manifestations, weakness, lack of well-being, and along with incapacity to regain their pre-operative level of functioning. Hence, all of these complaints may significantly reduce Quality of Life (QoL) **(Raidou et al., 2024).** In this regard, it is essential to meet the patients' needs as well as to ameliorate both physical and psychological aspects of patients' wellbeing and quality of life (QoL) (**Choshi et al. 2020),** (**Chen et al. 2020)**, and **(Asadi et al., 2019)**. Based on clinical findings, it has been estimated that there is a direct positive correlation between increased physical activity and functionality, and enhanced life quality **(Ceylan et al., 2024).**

However, neglecting the patients' psychological problems can lead to exacerbation of depression, stress, and anxiety in them as consequences of their conditions. It can also diminish their sense of happiness that is an essential aspect of each individual's needs **(Molazem et al., 2022).**

QoL has many features including individual's health (physical, mental, and spiritual), education status, personal relationships and social-belonging, social status, work environment, economic status, a sense of safety and security, freedom, independency in making decision, as well as environmental aspect **(Teoli et al., 2023).** However, a high QoL can be confirmed by the capability of implementing activities of daily living involving physical mobility, independent self-care, enough level of energy for self-care, effective social relationships, emotional stability, comfort without pain complaints, in addition to convenient environment and getting sufficient sleep and rest **(Pačarić et al., 2020).**

Patients with cardiac surgeries have significantly poor QoL as they are often susceptible to psychological disorders as well as and negative thought styles which notably affect their quality of life. If the cardiac patient demonstrates coping strategies, including emotion-focused or problem-focused techniques, it improves their physical and psychological health as well as their interpersonal relationships. These strategies are also beneficial in supporting financial concerns, security, daily life functioning, and home environment **(Iqbal et al., 2021).**

Interestingly, resilience is commonly seen as a protective strategy that enhances patients' mental health and well-being, and thereby enables patients cope with cardiac diseases and their consequences. The results of the cross-sectional study showed that resilience was significantly lower among patients with history of cardiac interventions than that among those with no cardiac procedures. **(Al Ali & Al Ramamneh, 2022).** Nowadays, the integration of resilience-focused interventions, often referred to as resilience bundles, has evolved as a promising approach to facilitate self-care practices and the overall QoL for patients undergoing cardiac surgery **(Molazem et al., 2022)**.

Significance of the study:

Many patients value quality of life over quantity. Thus, increased patient engagement, fully informed consent, and improved healthcare delivery can result from understanding how cardiac surgery affects patients' long-term QoL **(Grand et al., 2018).** Noteworthy, improving both survival and QoL are considered as major reasons to perform cardiac surgery **(Neumann et al., 2019).**

It is important to understand the relationship between patients with cardiac surgery distress and their QoL components in order to attain more successful patients' support and to improve their health outcomes. Research reveals that post-surgical distress is reflected in various elements of patient's QoL. It has moderate-to-strong effects for social factors such as marital status and social relationships, moderate effects for behavioral factors including physical activity and fitness, and moderate effects for environmental factors as in employment issues. (**Caccamo et al., 2020).** However, recovery from cardiac surgery can be long and requiring strenuous effort. The current evidence suggests that the main pressing health issue for patients with cardiac surgery is psychological distress **(Ono et al., 2022).**

This study might provide resilience bundle as an approach for enhancing patients' recovery after cardiac surgery and QoL, maybe by including some optional physical and psychological interventions after

surgery utilizing and facilitating some of patients' coping mechanisms (e.g., *education about condition, physical exercises, meditation, mindfulness, progressive muscle relaxation exercise, and deep breathing exercise).*

Aim of the study

The aim of this study was to evaluate the effect of resilience bundle in improving quality of life for patients with cardiac surgery.

The aim was accomplished through the following specific objectives:

1. Assess knowledge for patients with cardiac surgery.
2. Assess quality of life for patients with cardiac surgery.
3. Develop, implement, and evaluate the resilience bundle for patients with cardiac surgery.

Research hypothesis:

The following research hypotheses have been formulated to achieve the aim of the study:

H1: The mean knowledge scores will be higher after implementing resilience bundle for patients with cardiac surgery.

H2: Quality of life for patients with cardiac surgery will be enhanced after implementing resilience bundle.

Operational definitions:

Cardiac surgery is the surgical intervention that involves a variety of cardiac and revascularization surgeries including coronary artery bypass graft (CABG) surgery, coronary artery interventions (PCIs), and valve surgery.

Quality of life is a concept involves common aspects including individual's health (physical, mental, and spiritual), education status, personal relationships and social-belonging, social status, work environment, economic status, a sense of safety and security, autonomy in making decision, as well as environmental aspect.

Resilience Bundle is a variety of acquired skills, attitudes, and interventions incorporates a case-related patient's education, dietary intervention, physical activity, deep breathing exercises, progressive muscle relaxation technique, meditation, and mindfulness.

Subjects and methods:

Research design:

Quasi-experimental one-group pretest/ posttest research design was utilized to achieve the aim of present study. Quasi-experiment is used to set up a cause-and-effect relationship between an independent and dependent variable, similar to the true experiment. However, quasi-experiment is different from true experiment in that it does not rely on random assignment of subjects to groups. Actually, quasi-experimental studies are frequently used in clinical specialties as nursing because they are more suitable for the real-world natural setting than true experimental research designs **(Thomas, 2022).**

Setting of the study:

The present study was conducted in outpatient clinics building affiliated to Zagazig university hospitals. Cardiology clinics located in first floor and comprised of ECG clinic, stress ECG clinic, cardiothoracic surgery clinic, cardiac disorders clinic, heart rhythm disorders clinic, a hypertension clinic, in addition to a waiting area and two classrooms.

Subjects of the study:

Subjects:

A purposive sample of 40 patients with cardiac surgery of both genders were recruited for this study.

Inclusion criteria:

Patients who completed six months or more post cardiac surgery; ages of 18 to 60-year-old, stable general health status, and able to communicate.

Exclusion criteria:

Patients who have complications that interfere with their self-care practice (as cerebral stroke, paralysis, or handicap), patients with cognitive or mental illnesses, and end-stage chronic diseases were excluded from the study.

Sample size:

Sample size calculation based on year 2022 records of patients' admission to the cardio-thoracic surgery department, the total number of subjects assigned to perform cardiac surgeries was 400. Steve Thompson equation was used to calculate the sample size, at 5% ∞ error (95.0% significance), 20.0 β error, with 80.0%. power of the test.

$$n = \frac{N \times p(1-p)}{[[N-1 \times (d^2 \div z^2)] + p(1-p)]}$$

Where: N= Population size (400), Z= degree of standardization for 95.0% significance, it is equal to 1.96, d= Error percentage (0.05), P= Percentage of occurrence of event or not, it is 0.5. Accordingly, the sample size was determined to be 39.99. Therefore, 40 patients were enrolled and assigned to receive resilience bundle.

Sampling technique:

A purposive sample of 40 cases of patients with cardiac surgery of both genders who follow up in cardiology clinic at Zagazig university hospitals were recruited for this study fulfilling the inclusion criteria.

Tools of data collection:

Two tools were used to collect the necessary data in this study. These tools involved:

Tool I: Patient's Interview Questionnaire: It was developed by the researcher after reviewing related literature in a simple Arabic language to avoid misunderstanding. It was composed of three parts:

Part I: Demographic data of the study participants were consisted of eight closed-ended questions including "patient's age, gender, marital status, educational level, occupation, residence, income, and living status.

Part II: Health history and cardiovascular health assessment of study participants were composed of nine questions about medical diagnosis, previous cardiac surgeries, type of surgery, comorbidities, associated manifestations, family history, smoking, drug allergies, and Patient cardiovascular health assessment questionnaire". It was scored using frequency and percentage distribution of the studied patients according to health history.

Part III: Patient's knowledge regarding health condition, line of treatment, complications, medications, nutritional status, physical activity, pain management, and sleep quality. It was adapted from **(Farzam & Jan, 2024), (Kabir et al., 2024), (Li et al., 2024), (Whitlock, 2024), (Alpert, 2023),** (**Arif & Aggarwal, 2023), (de Oliveira et al., 2023), (Diab et al., 2023), (Grant et al., 2023), (Moneruzzaman et al., 2023), (Reinhart, 2023), and (Reintjes, 2023).**

Part III included 40 questions divided into six sections.

Section A: Patient's knowledge regarding health condition, line of treatment, and complications. It included six multiple-choice questions.

Section B: Patient's knowledge regarding medications. It included six single-and eight multiple-choice (total of fourteen) questions.

Section C: Patient's knowledge regarding nutrition. It included one single- and five multiple-choices (total of six) questions.

Section D: Patient's knowledge regarding physical activity. It included six multiple-choice questions.

Section E: Patient's knowledge regarding pain management. It included four multiple-choice questions.

Section F: Patient's knowledge regarding sleep quality. It included one single- and three multiple-choice (total of four) questions.

Total scoring of knowledge questions:

The total number of questions regarding knowledge was 40 questions with a total score of 156 grades (100%). In questions (8, 9, 12, 16, 19, 20, 24, and 39), each question had one correct answer, if the patient's answer was correct, patient would score one grade. On the other hand, the remaining questions had more than correct answer and scored 1 for each correct choice out of total question score and then all selected options were collected, and score given. However, in question (3), options a and b were correct; so that each option scored one grade and then selected options collected and score given. If the patient selects "both a and b", patient would score the total marks of the question. The option of "I don't know" had a score of zero grade. Based on statistical analysis, knowledge level was considered satisfactory at cut-off point ≥ 70% and it was considered unsatisfactory at cut-off point < 70%.

Tool II: WHO Quality of Life Scale-Brief (WHOQOL-Brief):

This tool was adapted from WHOQOL-Brief scale designed by **Whoqol Group. (1998).** It involved twenty-six items taken from the WHOQOL-100 to assess patients' quality of life and consisted of overall quality of life and general health, and four domains including physical health, psychological health, social relationships, and environment. In the scale, overall patient's QoL and general health were measured by two questions about QoL and health satisfaction; Physical health (domain 1) was measured by seven questions; Psychological health (domain 2) was measured by six questions; Social relationships (domain 3) were measured by three questions; and Environment (domain 4) was measured by eight items.

The total score of this scale was 130 grades (100%). All items were scored using a five-point Likert scale that scored (1 to 5) that varied from "very dissatisfied" to "very satisfied", respectively. The two items that measured overall QoL and general health had a raw score range of 2–10 grades, in addition to four domains of QoL included: Physical health that got a raw score range of 7–35 grades, psychological health got a raw score range of 6-30 grades, social relationships had a raw score range of 3-15 grades, and environment domain got a raw score range of 8 – 40 grades. In this scale, three items needed to be reversed before scoring and indicated by the "(*)" denotation in the direction of scaling column. Quality of Life (QoL) results were expressed by Mean and Standard deviation. Based on statistical analysis, patient's total scores of ≥ 60 denoted a good quality of life, while total scores of < 60 denoted a poor quality of life.

Face and content validity: The tools were revised by a panel of five expertise professors from different specialties including medical and nursing faculty staff included three professors of medical surgical nursing and two professors of cardiology reviewed the tools' content for clarity, relevance, comprehensiveness, applicability, understandability, and easiness for implementation. All recommended modifications were done.

Internal consistency (reliability) of the tool: Cronbach's alpha test was used to measure the internal consistency (reliability of used tool). It was (0.815) for WHO quality of life scale-brief.

Administrative and Ethical Considerations:

An official permission for conducting the study in Zagazig University Hospitals was obtained from the hospital administrative personnel and the directors of the outpatient clinics by the submission of formal letter from the dean of the faculty of nursing to conduct this study. At the interview, an informed consent for participation was taken both verbally and in written form each patient after full explanation of the aim of the study. They were informed that their participation in this study is voluntary. The patients were given the opportunity to refuse participation and notified that they could withdraw at any phase of the data collection

without given reason. Moreover, the patients were assured that any information taken from them would be confidential and used only for research purposes.

A Pilot study: It was conducted on 10% of total sample to judge the feasibility of conducting the study, its objectivity, and ability to elicit the desired information, and to estimate time needed for data collection as well as to identify any possible obstacles that may hinder the data collection. Moreover, the pilot study helped in estimation of time required to fill in the sheets. Then, the tools were modified according to the results of pilot study.

Field work:

Preparatory (Assessment) phase: This phase was concerning to construction of the study tools and production of resilience bundle by the researcher based on extensive review of current, related literature; it was written by simple Arabic language and included colored pictures with simplified illustrations to facilitate patients' understanding.

Once all necessary permissions were granted officially to proceed with the study, the field work was started in January and lasted to September 2024. The researcher visited the study setting, met with the director and head nurses to explain the aim of the study and the needed procedures, and to get their approval and cooperation. Then the researcher met patients with cardiac surgery who were eligible for the study, introduced himself, and the study purpose was explained. The patient who gave verbal and written consent to participate was interviewed individually, handed the self-administered questionnaires, and received relevant instructions regarding filling process. The study was conducted through four phases: preparatory, planning, implementation, and evaluation.

Planning phase:

During this phase, the researcher designed the resilience bundle based on review of the most recent, relevant, and appropriate literature, and under the guidance of the supervisors. The main goal was to evaluate the effect of resilience bundle in improving QoL for patients with cardiac surgery. It involved three parts; knowledge part, quality of life part, and resilience bundle application part.

Implementation phase:

The study was implemented in the form of sessions carried out in the study settings for the study participants over four days on weekly basis (Sunday, Monday, Wednesday, and Thursday) from 9:00 am to 1:00 pm.

The researcher interviewed the study participants to implement resilience bundle on individual basis and in small groups (2-3 participants) meetings. The content of the resilience bundle intervention was distributed over 8 consecutive sessions (each session was covered over 50–60 minutes). The first session was dedicated for orientation to clarify aim and contents of the resilience bundle intervention, its general objectives, the teaching methods, learner's activities, and evaluation methods. Three sessions covered the theoretical part of the intervention, whereas the remaining four sessions were for the practical part. These included one session for demonstration and re-demonstration of the pre-determined physical exercises, one session for demonstration and re-demonstration of steps of breathing exercises, one session for demonstration and re-demonstration of steps of progressive muscle relaxation exercise, and the last session for demonstration and re-demonstration of steps of meditation and mindfulness exercises. Theoretical part covered in the first chapter of the booklet, and the practical part covered over the second and third chapters for the purpose of guiding the patients. The researcher handed the booklet of the resilience bundle intervention to each patient participated in the study.

Evaluation phase:

The researcher evaluated the study sample over three phases (pre-, post, and follow-up) to get the results representing the effect of resilience bundle in improving QoL for patients with cardiac surgery.

Intervention sessions and guide: In addition, a booklet in Arabic language was designed and developed by the researcher according to the needs of patients, relevant scientific references, and the opinions of specialists in the field. It includes a theoretical part and two parts for the practical aspect.

Statistical Analysis:

The collected data were revised, coded, organized, tabulated, and statistically analyzed using SPSS 25.0 for windows. Quantitative data were expressed as the mean ± SD & (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percentages of categorical variables were compared using Chi-squared test ($\chi 2$) or Fisher's exact test when appropriate. Quantitative continuous data were compared using one-way ANOVA or Kruskal-Wallis tests. Spearman rank correlation coefficient was calculated to assess relationship between various study variables, (+) sign indicated direct and positive correlation & (-) sign indicated an inverse correlation, also values near to 1 indicated strong correlation & values near to 0 indicated a weak correlation. Specifically, r = 0.1 - 0.24 indicated a weak correlation; r = 0.25 - 0.74 indicated an intermediate correlation; and r = 0.75 - 0.99 indicated a strong correlation. Also, multiple linear regression analysis was used to compare the two classes. All tests were two-sided. P-value ≤ 0.05 was considered statistically significant (S), and p-value > 0.05 was considered statistically insignificant (NS).

Results

The results of the study were tabulated as follows:

Table 1: Frequency and Percentage Distribution of Demographic Characteristics of Study Subjects (N=40).

Demographic characteristics	Studied patients	
	Frequency (No.)	**Percent. (%)**
Age (year)		
< 40	2	5.0
≥ 40	38	95.0
Mean± SD	54.52±0.92	
Range	38-60	
Gender		
Male	34	85.0
Female	6	15.0
Marital status		
Married	38	95.0
Not married	2	5.0
Educational Level		
Educated	38	95.0
Not Educated	2	5.0
Occupation		
Working	19	47.5
Not working	21	52.5
Place of residence		
Rural	10	25.0
Urban	30	75.0
Income		
Sufficient	21	52.5
Insufficient	19	47.5
Living status		
With family	38	95.0
Without family	2	5.0

Table 1: Reveals that the most studied patients' ages were more than 40 years with the mean age (54.52±0.92) and majority (85%) of the studied patients were males. Also, the most of the studied patients (95%) were married, educated, and living with their families. Moreover, more than half of patients not working and had a sufficient income (52.5%). Finally, only one-quarter of the studied patients lived in rural areas.

Table 2: Frequency and Percentage Distribution of the Studied Patients According to Health History (N=40).

Health History	Frequency (No.)	Percent. (%)
Diagnosis		
Coronary artery bypass grafting (CABG)	17	42.5
Ischemic heart disease (IHD)	15	37.5
Valve replacement	6	15.0
Mitral valve stenosis	2	5.0
Comorbidity		
Hypertension (HTN)	13	32.5
Diabetes (DM)	11	27.5
Osteoarthritis	1	2.5
Bone Fracture	4	10.0
Respiratory diseases	2	5.0
Chronic Kidney Diseases	1	2.5
Liver Diseases	1	2.5
Ophthalmic problems	5	12.5
Manifestations		
Chest pain	26	65.0
Dyspnea	22	55.0
Palpitation	14	35.0
Headache	12	30.0
Sputum	20	50.0
Fatigue	30	75.0
Loss of appetite	7	17.5
Family history		
Yes	24	60.0
No	16	40.0
Smoking		
Current smoker	21	52.5
Previous smoker	11	27.5
Not smoker	8	20.0

Table 2: Shows that more than two-fifths (42.5%) of the studied patients had a diagnosis of CABG, most (97.5%) of the studied patients had previous surgeries, and three-quarters (75%) of the studied patients had percutaneous coronary intervention. Regarding comorbidity, (32.5% & 27.5% respectively) of the studied patients had hypertension and diabetes. Regarding patients' manifestations, nearly two-thirds (65%) of patients had chest pain, and three-quarters (75%) had fatigue. Also, three-fifths (60%) of the studied patients had a previous family history of cardiac surgeries, and more than half (52.5%) of the sample were current smokers.

Table 3: Frequency and Percentage Distribution of the Studied Patients According to Cardiovascular Health Assessment (Hemodynamic, Investigations and Related Data) throughout Study Phases (N=40)

Assessment Data	Pre		Post		Follow-Up		χ^2 (P_1- value) Pre/post	χ^2 (P_2- value) Pre/FU
	No.	%	No.	%	No.	%		
Systolic blood pressure Normal	29	72.5	36	90.0	38	95.0	4.021	7.440
Abnormal	11	27.5	4	10.0	2	5.0	0.083	0.013*
Diastolic blood pressure Normal	29	72.5	36	90.0	38	95.0	4.021	7.440
Abnormal	11	27.5	4	10.0	2	5.0	0.083	0.013*
Adventitious breath sounds								
None	27	67.5	36	90.0	38	95.0	6.050	9.928
Crackles	13	32.5	4	10.0	2	5.0	0.027*	0.003*

Cholesterol level								
Normal	25	62.5	37	92.5	37	92.5	10.323	10.323
Abnormal	15	37.5	3	7.5	3	7.5	(0.003*)	(0.003*)
Chest pain								
No	11	27.5	20	50.0	25	62.5	7.168	11.944
Only with effort	25	62.5	20	50.0	15	37.5	(0.019)	(0.002*)
Always	4	10.0	0	0.0	0	0.0		
Body Mass Index (BMI)								
Underweight	1	2.5	3	7.5	2	5.0	7.655	9.577
Normal	10	25.0	19	47.5	22	55.0	(0.052)	(0.016*)
Overweight	24	60.0	17	42.5	15	37.5		
Obese	5	12.5	1	2.5	1	2.5		
Blood glucose level								
Normal	25	62.5	32	80.0	34	85.0	2.990	5.230
Abnormal	15	37.5	8	20.0	6	15.0	(0.137)	(0.041*)

***: Statistically significant at p ≤ 0.05; (χ2): chi-square test**
P_1: P-value for comparing between study group at pre- and post-intervention
P_2: P-value for comparing between study group at pre- and follow-up phase.

Table 3: Clarifies that there were statistically significant differences between systolic and diastolic blood pressure of the studied patients throughout the pre- and follow-up phases of the study with an exact p-value of 0.013. In addition, there were statistically significant relations between adventitious breath sounds (Crackles) of the studied patients in the Pre/Post and Pre/Follow-up intervention phases with p-values of 0.027 & 0.003 respectively. The same table indicates that there were high statistically significant relations between cholesterol levels of the studied patients in the Pre/Post and Pre/follow-up intervention phases with a p-value of 0.003. Moreover, there were statistically significant relations between chest pain and BMI of the studied patients in Pre/Post and Pre/Follow-up intervention phases with p-values (0.019 & 0.002) and (0.052 & 0.016) respectively. Also, there were statistically significant differences between blood glucose level of the studied patients in Pre/Follow-up intervention phases with exact p-value of (0.041).

Table 4: **Frequency Distribution of Total Level of Satisfactory Patients' Knowledge Regarding Cardiac Surgery throughout Study Phases (N=40**)

Patients' Knowledge Regarding Cardiac Surgery	**Pre**		**Post**		**Follow-up**		**χ2 (P_1- value) Pre/post**	**χ2 (P_2- value) Pre/FU**
	No.	**%**	**No.**	**%**	**No.**	**%**		
knowledge regarding health condition, line of treatment, and complications	19	47.5	40	100.0	39	97.5	28.475 (<0.001*)	25.078 (<0.001*)
Mean± SD	15.87±3.45		21.87±1.15		21.50±1.61		H=66.487	(<0.001*)
Patient's knowledge regarding medications	2	5.0	37	92.5	37	92.5	61.288 (<0.001*)	61.288 (<0.001*)
Mean± SD	12.80±5.28		30.65±3.20		29.37±3.78		H=79.512	(<0.001*)
Patient's knowledge regarding nutrition	19	47.5	40	100.0	39	97.5	28.475 (<0.001*)	25.078 (<0.001*)
Mean± SD	14.05±3.18		19.15±1.07		18.47±1.92		H=64.310	(<0.001*)
Patient's knowledge regarding physical activity	28	70.0	37	92.5	36	90.0	6.646 (0.020*)	5.0 (0.048*)
Mean± SD	21.50±2.56		25.12±4.12		23.57±4.73		H=35.925	(<0.001*)
Patient's knowledge regarding pain management	28	70.0	36	90.0	36	90.0	5.0 (0.048*)	5.0 (0.048*)
Mean± SD	22.57±1.79		26.50±4.10		24.65±4.78		H=50.744	(<0.001*)
Patient's knowledge regarding							22.029	19.286

sleep quality	19	47.5	38	95.0	37	92.5	(<0.001*)	(<0.001*)
Mean± SD	9.80±1.50		13.12±1.95		12.27±1.90		H=51.035	(<0.001*)
Total Level of knowledge:								
≥ 70 % Satisfactory	6	15.0	37	92.5	36	90.0	48.322 (<0.001*)	45.113 (<0.001*)
< 70 % Unsatisfactory	34	85.0	3	7.5	4	10.0		
Mean± SD	96.60± 10.42		136.42± 12.79		129.85± 15.68		H=50.690	(<0.001*)

***: Statistically significant at p ≤ 0.05; (H): Kruskal Wallis test; (χ2): chi-squared test**
P_1: P-value for comparing between study group at pre- and post-intervention
P_2: P-value for comparing between study group at pre- and follow-up phase.

Table 4: Clarifies that in the pre-intervention phase, the majority (85.0%) of the studied subjects had unsatisfactory knowledge regarding cardiac surgery with Mean± SD = 96.60±10.42, while in the post- and follow-up phases of the intervention, most (92.5% & 90.0% respectively) of the studied subjects had satisfactory knowledge regarding cardiac surgery with Mean± SD=136.42±12.79 & 129.85±15.68 respectively.

Table 5: Comparison between Mean Score of QoL Subscales Among Cardiac Surgery Patients throughout the Study Phases (N=40).

Mean Score of QoL Subscales	Pre	Post	Follow-up	F	P-value
	Mean ± SD	Mean ± SD	Mean ± SD		
Physical health.	22.47±2.56	23.72±1.55	24.70±3.05	8.150	(<0.001*)
Psychological health	20.97±2.04	23.35±6.55	23.92±2.45	5.522	(<0.001*)
Social relationships	11.02±1.38	13.87±1.84	14.25±1.46	21.044	(<0.001*)
Environment	27.42±3.10	30.32±2.15	30.60±1.83	50.052	(<0.001*)
Overall quality of life and general health.	81.90±6.73	91.27±8.11	93.47±4.93	33.456	(<0.001*)

***: Statistically significant at p ≤ 0.05; (F): one-way ANOVA**

Table 5: Indicates that there were high statistically significant differences throughout the study phases (pre-, post, and follow-up) as regards to mean score of QoL subscales among cardiac surgery patients (p< 0.001).

Table 6: Scoring of Patients' QoL throughout the Study Phases (N=40).

Scoring of Patients' QoL	Pre		Post		Follow up		χ2 (P_1- value) Pre/post	χ2 (P_2- value) Pre/FU
	N	%	N	%	N	%		
< 60 Poor quality of life	26	65.0	8	20.0	6	15.0	17.542 (<0.001*)	21.874 (<0.001*)
≥ 60 Good quality of life	14	35.0	32	80.0	34	85.0		

***: Statistically significant at p ≤ 0.05; (χ2) chi-squared test**
P_1: P-value for comparing between study group at pre- and post-intervention
P_2: P-value for comparing between study group at pre- and follow-up phase.

Table 6: Clarifies that in the pre-intervention phase, nearly two-thirds (65.0%) of the studied subjects had a poor quality of life related to cardiac surgery, while in post- and follow-up phases, the majority (80.0% & 85.0% respectively) of the studied subjects had a good quality of life related to cardiac surgery. Also, the same table showed that there were highly statistically significant differences between the pre/post and pre/follow-up phases as regards the total score for patients' quality of life, related to cardiac surgery (p< 0.001).

Table 7: Correlation Coefficient between Patients' Knowledge and their Quality of Life in the Post-Intervention Study Phase (N=40)

Items		Knowledge		Quality of life	
		R	P	R	P
Post	**Knowledge**	-	-	.406**	.009
	Quality of life	.406**	.009	-	-

(*) Statistically significant at p<.05; (**) Statistically significant at p<.01; (r) Spearman rank correlation

Table 7: Shows that in the post-intervention phase, there was high statistically significant positive correlation between the patients' knowledge and their QoL with r= 0.406 at P< 0.01.

Table 8: Best Fitting Multiple Linear Regressions Model for the Change in Quality of Life in Post-Intervention Phase

Variables	Unstandardized Coefficients		Standardized Coefficients	T -test	P value	95 % Confidence	
	B	Std. Error	Beta			Lower Bound	Upper Bound
Quality of life (Constant)	72.274	25.640		2.819	0.008	56.543	25.415
Age	3.041	1.022	0.227	2.975	0.003	1.022	5.060
Knowledge	3.513	0.991	0.499	3.546	0.001	1.354	5.932
R square= 0.148 Model of ANOVA: F=6.92 p <0.001*							
Variable entered and excluded (Educational level).							

Table 8: Clarifies that linear regression analysis was performed to detect significant predictors of QoL score. The dependent variable was QoL score in post-intervention phase, while the independent variables were: age, educational level, knowledge, nutrition, physical activity, pain medication control, sleep quality, and coping strategy. Regression model results revealed that age, knowledge, and coping strategy were significant positive predictors of QoL. There were statistically significant direct positive correlations between age, knowledge, coping strategy, and QoL score where an increase in all of these variables was associated with an increase in QoL score.

Discussion:

Discussion of the current study findings with other relevant research findings investigating the related areas of the study will be presented in parts including; demographic characteristics, health history, and cardiovascular health assessment of study participants; frequency distribution of patient's knowledge; patients' QoL post cardiac surgery; correlations between QoL and level of knowledge for study subjects; in addition to a multiple linear regression analysis that was performed to detect significant predictors of QoL score (age, knowledge, educational level) and QoL.

Regarding socio-demographic characteristics, results of the present study revealed that the majority of the studied patients were more than 40 years old. These findings were supported by **El-ghiety et al. (2019)** study indicated that around two-thirds of the studied adult patients were between 40 and 60 years and male patients accounted almost two-thirds of the total (60 participants) sample.

Also, results of the present study indicated that the majority of the studied patients were males which were in line with **Chaganty et al. (2023)** aimed at studying the temporal evolution in cardiovascular disease-related mortality that revealed a higher prevalence of cardiovascular diseases in males than females throughout the study period which might support our findings.

Regarding patients' level of education, in the present study, the majority of studied patients were educated. These findings were supported by **Mousa Elsaed et al. (2020)** study which revealed that more than two-thirds of the studied patients were educated and more than half of total number of studied patients had university education. On the other hand, **Ceylan et al. (2024)** findings of the study were opposite to our study findings in that more than a half of the studied participants had low level of education.

Regarding health history, results of the present study showed that more than two-fifths of the studied patients had CABG surgery. These findings were congruent to some degree with **Vervoort et al. (2024)** study reported that globally, approximately one-quarter of patients with cardiac surgeries had CABG between 2010 and 2021.

Regarding comorbidity, around one-third of studied patients had diabetes and hypertension. These findings were in line with **Bianco et al (2020)** in cohort study which indicated that more than one-third of studied patients were had diabetes. Also, **Sallam et al. (2022)** study indicated that nearly one-third of the studied patients had hypertension. Around one-third of studied patients had diabetes and hypertension, and three-fourths of them had previous family history to CVD. The discussed findings regarding patient's health history were supported by **Alpert (2023)** study conducted in United States about "New coronary heart disease risk factors" that showed diabetes mellitus, hypertension, positive family history for early manifestations of coronary artery disease, smoking, and sedentary lifestyle as risk factors increasing continuously the prevalence of cardiovascular diseases.

Regarding clinical manifestations, the findings of the present study showed that two-thirds of the studied patients had chest pain. These results could be related to many reasons such as surgical incisions, rib retraction, sternal fracture, prolonged immobility, intercostal nerve stimulation and pleural irritation from chest tubes. The findings of the present study were similar to **Öğüt & Dağ (2019)** study which revealed that a half to three-quarters of patients report post cardiac surgery pain.

Similarly, these findings were in line with **El-gafour et al. (2021)** study which revealed that around three-quarters of patients reported moderate to severe post cardiac surgery pain. Also, the findings of the present study showed that three-quarters had fatigue, and these findings were supported by **Yaman Aktas et al. (2021)** indicated that about half of patients in discharge training group had fatigue. Moreover, the findings of the present study showed that more than a half of the studied patients had exertional dyspnea. These problems were caused by the fact that post cardiac surgery pain hinders deep breathing, coughing, and ventilation thereby impedes getting rid of respiratory tract secretions, reducing vital lung and functional residual capacity, and consequently increases shortness of breath. According to **Srimookda et al., (2021),** it is common that patients complain of dyspnea symptom following surgery.

The findings of the present study were harmony with **Ali Ahmed et al. (2024)** study entitled "Dyspnea, fatigue and sleep quality post cardiac surgeries: effect of selected relaxation techniques" conducted on 90 patients at Minia university's cardiothoracic hospital in Egypt. which showed that nearly three-quarters of the studied patients had mild to moderate exertional dyspnea after eight weeks of having cardiac surgery.

Regarding cardiovascular health assessment, the results of the current study clarify the relation between hemodynamic data of studied patients throughout the study phases. Regarding BP, there were statistically significant progressive improvement in both SBP and DBP of the studied patients throughout pre- and follow-up phases of the study. On pre-intervention phase, nearly three-quarters of patients had normal SBP and DBP. On the other hand, majority of patients in post-intervention and follow-up phases had normal systolic and diastolic BP.

These findings were compared to and supported by **Senesael et al. (2023)** study that revealed decrease in blood pressure readings in more than two-fifths of the participants. Significant relation between improved exercise capacity and improved blood pressure was observed as the patients had higher systolic blood pressure

at the commencement of the sessions; while the mean systolic blood pressure for all patients was within normal limits at the end of the cardiac rehabilitation program.

In addition, there were statistically significant relations between adventitious breath sounds (crackles) of studied patients in Pre/Post and Pre/FU intervention phases; indicating an improvement in respiratory function due to breathing exercises. These findings were supported by **Oshvandi et al. (2020)** study showed that the group received breathing exercises had a significant improvement in pulmonary crackles on auscultation when compared to the control group.

Regarding laboratory and clinical investigations, the results of current study indicate that, there were high statistically significant relations between cholesterol levels of the studied patients in Pre/post and Pre/FU intervention phases. These results were congruent with **(Du et al., 2020)**. The study found that at six months after intervention, total cholesterol levels in the study group were significantly lower than those in the control group ($P<0.05$). The findings of the present study could be supported by and rationalized according to **Reinhart (2023)** reported that patient's blood pressure, blood cholesterol levels, and abdominal fat can be influenced by heart-healthy diet and eating habits.

Similarly, the findings of the present study illustrated that there was statistically significant improvement in chest pain of the studied patients in Pre/post and Pre/FU intervention phases. These findings were supported by **Viana, et al. (2023)** revealed a statistically significant reduction in pain intensity upon hospital discharge after suitable postoperative pain management compared to pain in ICU. Moreover, the findings of the present study illustrated that there were statistically significant changes in BMI and fasting blood glucose level of the studied patients in Pre/post and Pre/FU intervention phases.

Our study findings were supported by **Aslan, et al., (2019)** study showed a statistically significant decline in BMI and fasting blood glucose (FBS) level in exercise and diet groups, which may reflect the importance of combining of diet and exercise programs seems to be more effective.

Regarding total knowledge level about cardiac surgery, the findings of the present study indicated that in the pre-intervention phase, the majority of the studied subjects had unsatisfactory total knowledge level; while in the post and follow-up phases of the intervention, most of the studied patients had satisfactory total knowledge level regarding health condition, line of treatment, and complications; medications; nutritional status; physical activity; pain management; and sleep quality with statistical significant difference of $p<0.05$.

From the researcher's point of view, these findings regarding knowledge reflects the positive impact of resilience bundle implementation, which met the needs of patients with cardiac surgery and offered them sufficient knowledge to maintain their health. The findings of the current study were in the same line with **Buket & Ebru, (2018)** revealed that knowledge levels of patients were improved well after receiving a structured planned patients' education about cardiac surgery.

Regarding QoL scoring, the present study illustrated that nearly two-thirds of the studied patients in pre-intervention phase had poor QoL related to cardiac surgery, while in post and follow-up phases, the majority of the studied patients had good QoL related to cardiac surgery. Noticeably, the findings of the present study showed highly statistically significant differences between pre/post and pre/follow-up phases as regard to both total and mean scores of patients' QoL. These findings were in line with **(Ceylan et al., 2024)** cohort study that estimated a direct positive correlation between increased physical activity, functionality, and enhanced QoL.

Subih et al (2024) conducted a systematic literature review of clinical randomized trials and quasi-experimental studies published between 2013 and 2023 to examine the influence of implementing CR interventions on QoL and physiological status in patients with cardiac surgery. the results indicated substantial improvement in patients' QoL and physiological outcomes with practice of CR interventions. The findings of the current study were congruent with the results of this review.

Also, the findings of the current study were supported by **Mohammadi & Ahmadi (2018),** reported that the mean score of cardiac patients' QoL was significantly increased after practicing PMR and emotion regulation training in post-intervention stages. Additionally, the findings of the present study were in harmony

with **Hymowitz et al (2024)** study which suggested that mindfulness-based interventions (MBI) are efficient in enhancing health behaviors, alleviating pain, and reinforcing psychological wellbeing, and eventually improving patients' QoL. In researcher's opinion, patients with cardiac surgery are recommended to think of meditation and mindfulness as a commitment to rejoining with and caring for oneself.

Regarding Correlations between knowledge and QoL of the study subjects, the findings of the current study showed that in the post-intervention phase, there was high statistically significant positive correlation between the patients' knowledge and their QoL in the post-intervention phase of the study.

This can be explained through the fact that educated patients usually maintain their healthy life style and practice health related behavior than the patients with low level of knowledge. Similarly, patients with low educational level have low awareness of their condition and outcome.

These finding were in harmony with **Mansour et al (2021)** descriptive research entitled Quality of life for patients after coronary artery bypass grafting that was conducted at 3 hospitals in Port Said City in Egypt, that involved a convenient sample of 100 patients after CABG at outpatient clinics. The study reported that there were statistically significant relations between patients' knowledge level and their QoL.

Regarding predictors of QoL score, a multiple linear regression analysis was performed to detect significant predictors of QoL score. The dependent variable was QoL score post-intervention phase, while the independent variables were: age, educational level, and knowledge. Regression model results revealed that age and knowledge were significant predictors of QoL and there were statistically significant positive correlations between age and knowledge, and the patients' QoL score where an increase in both of these variables was associated with an increase in QoL score.

Referring to correlation between patients' age and their QoL, the findings of the present study were supported by **Coelho et al (2019)** prospective study that indicated significant improvement for majority of patients regarding their QoL after surgery, mainly within 3 months following the surgery. From researcher's point of view, this outcome could be due to the fact that with age, the patients' interests and priorities are modulated including increased attention to their QoL especially if encountered a threat to their health and life.

Conclusion:

In the light of the study findings discussion, it can be concluded that the findings supported the hypotheses of the current study and it was suggested that the patients' mean knowledge scores were higher, and quality of life for patients with cardiac surgery was enhanced after implementing resilience bundle for the studied patients.

Recommendations:

Based on the main findings of the current study, the following recommendations can be deduced:

- Similar study can be repeated by increasing substantially the sample size and possibly a trans-national study in order to further examine the dependability of these results and generalizability.
- However, the current study had found significant results that can be implemented in majority of post cardiac surgery rehabilitation programs all over the country.

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