Effect of Exercise Protocol on Patients undergoing Heart Valve Surgery -Reported Outcomes Measures

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Abstract:

Background: Exercise-based cardiac rehabilitation has been found to improve patient-reported outcome measures and would be beneficial after heart valve surgery. **Aim:** Evaluate effect of exercise protocol on patients undergoing heart valve surgery -reported outcomes measures. **Patients and methods: Research design:** A quasi-experimental research design (study/control) was utilized. **Sample:** A purposeful sample of sixty patients undergoing heart valve surgery from both sexes, patients were randomly assigned into two equal groups. **Setting:** Cardiothoracic surgery department and outpatient clinic in Assiut University Heart Hospital. **Tools:** A structured interview questionnaire, Heart QoL questionnaire and Edmonton Symptom Assessment System (ESAS-r). **Results:** High statistically significance (p value <0.001**) was found in the study's findings between study and control group patients in global score of heart QOL after one month (24.83±2&18.33±2.93 respectively) also after three months (41.2±1.42 &32.03±2.8693 respectively). Patients in the study group and those in the control group showed highly significantly difference from one another in terms of overall score of Edmonton Symptom Assessment System after one month of exercise protocol (48.3±7.05 56.67±6.1 respectively) and after three months (8.07±8.25 &15.17±6.64 respectively) with p value (<0.001**). **Conclusion:** The study's results elucidated that exercise protocol improved patients reported outcomes measures as quality of life and symptoms in study group patients in comparison with control group patients. **Recommendations:** Comprehensive Arabic guidebook about exercise training through perioperative valve surgery should be easy to access by patients to help in improvement in patient reported outcome measures.

Key words: Exercise protocol; Heart valve surgery and Patients Reported Outcomes Measures.

Introduction:

Heart valve disease (HVD) is a common form of heart disease and a major cause of morbidity and mortality worldwide and a major contributor of symptoms and functional disability (**Shahim et al., 2023)**. HVD is the next epidemic in the

cardiovascular field, affecting millions of people worldwide and has a significant effect on health care systems. The incidence and prevalence of VHD will keep rising as the population ages **(Messika-Zeitoun et al., 2023).**

The heart has four valves; the tricuspid, mitral, pulmonic, and aortic. These valves are essential to the hemodynamic circulation, which maintain pressure gradients and avoid backflow between the four heart chambers. Both the regurgitation from the valves and the insufficiency of the valves, which are secondary to valvular heart disease, allow backward flow and equalize pressure, which can be detrimental to cardiovascular function. On the other hand, the secondary valvular heart disease-related valve stenosis causes elevated pressures behind the blockage (which frequently leads to cardiac remodeling) and insufficient pressure front of the obstruction **(Aluru et al., 2022).**

Heart valve disease is when any valve in the heart has damage or is diseased. It is primarily caused by aging, certain diseases, congenital abnormalities or physiologic processes including rheumatic heart disease and pregnancy. Reduced cardiac function may arise from valve failure or dysfunction; however, specific consequences will vary depending on the type and severity of valvular disease **(Coffey et al., 2021).**

The cornerstone of treatment for heart valve disease has generally relied on surgery using procedures such as surgical valve replacement. Less invasive techniques like transcatheter valve implantation have grown in popularity recently, especially in patients whose surgical risk is prohibitive or severe **(Fifer et al., 2024).**

Heart valve surgery is an operation to repair a malfunctioning heart valve. Heart valve surgery can be divided into two major types: valve repair and replacement. A malfunctioning valve can be replaced by cutting additional tissue from its cusps and stitching the edges together. Special rings called ‘prosthetic rings’ or ‘annuloplasty rings’ can also be used to narrow an enlarged valve and strengthen the repair. Another method for opening a constricted valve is "Balloon Valvotomy". When a valve is beyond repair, it may be removed and replaced with a new one either a mechanical valve or biological tissue valve from an animal or human **(National Heart Foundation of Australia., 2023).**

Patient Reported Outcome Measures (PROMs) allow patients to provide feedback of any aspects of health status directly by themselves. One crucial strategy for operationalizing patient-centered care, a fundamental principle of health systems, is the use of PROMs in the health care **(Porter et al., 2021).**

Patients specify their perceived level of impairment, disability, and health status using PROMs, which are validated and standardized questionnaires, during the perioperative period. They are a valuable

source of accurate data on health-related quality of life (HRQoL). They permit the efficacy of a clinical intervention to be measured from the patients' perspective. PROMs evaluate how patients feel about their overall health or their health in connection to a particular disease, in addition to results associated with therapies **(Sokas et al., 2022).**

Cardiac rehabilitation (CR) is one of the key components of rehabilitation and an especially challenging one for rehabilitation specialists. Post-heart valve surgery, CR should involve diet and nutritional counseling, exercise training, physical activity counseling, quitting smoking, and psychosocial support **(Akpinar and Oral, 2023).**

In patients with heart disease, physical activity and exercise-based cardiac rehabilitation are thought to enhance cardiorespiratory fitness, reduce hospital stays on short term and cardiac mortality over the long term. Exercise also lowers the risk of respiratory complications, decreased loss of muscle strength, and lowers the probability of hospital readmission for patients with coronary heart disease. In order to improve clinical outcomes and physical capacity following heart valve surgery, exercise-based cardiac rehabilitation is advised **(Xue et al., 2022).**

Exercise training is a key element of cardiac rehabilitation (CR) which benefits patients with a range of cardiovascular disorders, such as heart failure, valvular heart abnormalities, and coronary artery disease. Most exercise-based CR programs incorporate both aerobic endurance training and respiratory muscle training, either with or without resistance training. A growing number of researches indicating that training programs offered in CR provide multiple health benefits including enhancements in peak oxygen consumption, myocardial flow reserve, symptoms and quality of life. Reduced rates of hospitalization and mortality may be linked to these health benefits (**Hosseinpour et al., 2024.)**

In addition to assessing patients' needs for cardiac surgery, nurses also play a crucial role in providing patients with comprehensive peri-operative nursing care, which includes care before, during, and after surgery. Preoperative evaluation is a collaborative procedure that helps patients recovers from surgery by giving them information, emotional and psychosocial support, and health education. In order to give the greatest treatment and attend to the patients' requirements both before and after surgery, the nurse also serves as the team's coordinator by gathering and protecting patient information **(Abboud et al., 2022).**

The nurse provides patients receiving heart valve surgery with comprehensive care in all aspects. Not only does the nurse provides direct care during hospital stays and surgical episodes, but also empowers the patient directing self-management and collaborate the contributing disciplines. Knowledge of pharmaceutical side effects, disease features, compliance, and recommended food and exercise are among the educational components. In order to improve cardiovascular fitness, the nurse promotes independence and higher levels of activity **(Abboud et al., 2022).**

Significance of study:

25% of heart failure patients in Egypt are caused by valvular heart disease, which ranks second in the country after ischemic heart disease. This observation was made in several locations of the country **(Youssef, 2021)**. Heart valve disease surgical therapies will probably become much more common. It is usually recommended that patients who have had valve replacement or other treatments engage in exercise-based cardiac rehabilitation. The assessment of PROMS in patients with heart valve dysfunction and associated treatments is not well documented in researches. Therefore this study would be performed to evaluate effect of exercise protocol on Patient-Reported Outcome Measures among patients undergoing heart valve surgery.

Operational definition

Patients Reported Outcomes Measures (PROMS: PROMs are quantitative indicators of how well patients feel about their overall quality of life, functional limitations caused by their illness and its symptoms. PROMs are quantified measures of patients' perspectives regarding their quality of life, functional limits caused by their illness, and symptoms (**Ketilsdottir et al. 2019).**

In this study PROMS which were evaluated by researchers;

- Quality of life.
- Symptoms.

Aim of the study:

The current study's aims were to evaluate how an exercise protocol affected patients' reported outcomes measures in patients having heart valve surgery through the following;

1. Assessing quality of life among patients undergoing heart valve surgery.
2. Assessing symptoms among patients undergoing heart valve surgery.
3. Developing, implementing and evaluating effect of exercise protocol on quality of life and symptoms.

Hypotheses:

The following research hypotheses would be developed in order to achieve the study's aims:

H1: Patients who will receive exercise protocol will report an improvement in quality of life than control group patients.

H2: Study group patients who receive exercise protocol will report an improvement in symptoms than control group patients.

Patients and methods

Research design:

Quasi experimental research design (study and control) was utilized to conduct this study. The independent variable in this study was implementation of exercise protocol, and the dependent variable was PROMS in patients undergoing heart valve surgery.

Setting:-

This study was conducted at Assiut University Heart Hospital in the cardiothoracic surgery department and outpatient clinic. The setting was chosen by the researchers because it is the largest specialized hospital in Upper Egypt for heart surgery and cardiovascular disorders, and it is also the pioneer in offering distinguished and high-quality health services. Cardiothoracic surgery department located in the 5th floor and outpatient clinic located in 1st floor. Cardiothoracic surgery department consists of: Three intermediate

care rooms, each room has two beds beside eight inpatient rooms (four rooms for male and four for female patients), each room has three beds.

Patients: -

A purposive sample of sixty patients of both sexes who were between the ages of 18 and 65 years. Participants in this study would include those who were scheduled for heart valve surgery due to a diagnosis of substantial heart valve disease (stenosis, regurgitation, or both). The sample was randomly and alternately divided into two equal groups: the control group (n = 30 patients) received standard hospital instructions and the study group (n = 30 patients) received prescribed treatment regimen by specialists in cardiothoracic surgery department in addition to an exercise protocol.

- Inclusion criteria include post-operative hemodynamically stable patient without major complications post-surgery such as serious arrhythmias at rest, pulmonary emboli and stroke, patients without associated diseases as chronic renal failure, enough mental capacity and availability for telephone follow-up.
- Exclusion criteria included: Conditions that might restrict exercise such as Parkinson disease, presence of artificial joints and patients who refused to complete.

Sample size

G power software was used to calculate the study sample size as seventy patients. Only sixty patients continued with the researchers to the end of follow up (Thirty patients per group) and the other ten patients excluded (eight patients not tolerated to exercise protocol and two patients died). Power 95 percent effect size 0.8, and error 0.05 was used to test differences between two independent means two tailed.

Tools:

To fulfill the current study's objective, three data gathering tools were employed.

Tool (I): A structured interview questionnaire.

The researchers designed it for the purpose of assessing patient demographic and medical data: It included two parts;

Part (I): **Demographic and health related data for the patients as** (age, gender, occupation, marital status, residence, level of education, smoking and body mass index).

Part (II): Medical data: It included questions as the medical history of the patient such as the type of diseased valve, type of operation (valve replacement or repair), type of surgery technique (open heart or closed), type of valve used (biologic or mechanical) and any co-morbidity.

Tool II: The Heart QoL questionnaire (Oldridge et al., 2014).

Heart QoL questionnaire is a patient reported outcomes for assessing achievement of health goals and evaluating health care intervention effectiveness and it is a validated heart-specific tool that assesses reported HRQoL throughout the preceding four weeks. It was adopted by researchers to assess quality of life in patients.

Scoring system:

It consisted of 14 items total as a global scale, 10-item physical subscale and 4-item emotional subscale. Higher scores correspond to higher HRQoL. The items range 0–3 (poor to better HRQL). As the

mean of the item scores, scores are determined.

Tool III: Edmonton Symptom Assessment System (ESAS-r)

ESAS was initially designed by **Bruera et al., (1991) and revised by Watanabe et al., (2011).** It was adopted by researchers to assess symptoms. It was a 10-item questionnaire that allows patients to rate their current symptoms on a visual numeric scale to assess different symptoms as pain, tiredness, drowsiness, nausea, lack of appetite, shortness of breath, depression, anxiety, appetite, well-being. Arabic version was adopted by researchers.

Scoring system:

It utilizes use of a numerical rating system (0–10 points, where 0 is the best potential health status and 10 are the worst). The total symptom burden score is the sum of the ten symptom scores and ranges from 0 to 100. Higher scores are indicative of more severe symptoms.

Tools validity

Five experts—two medical staff members from the cardiothoracic surgery department and three nursing staff members from the medical-surgical nursing performed the content validity assessment by evaluating the tools for readability, comprehensiveness, application, and ease of use. Slight modifications were performed for the current study content according to the experts' opinion. The experts` opinion was concluded as the study content was valid and can be recommended. It was calculated and found to be very beneficial = 0.76.

Tools reliability

Reliability for **tool II: The Heart QoL questionnaire** has proven to be a reliable instrument with a Cronbach's α between 0.80 and 0.91 for the global score and each subscale. **Tool III: Edmonton Symptom Assessment System (ESAS-r)** has shown to be a reliable tool to measure the self-reported symptoms of patients with an overall Cronbach's α of 0.79.20.

Pilot study:

A pilot study was conducted on 10% of the study subjects which equal to six patients who were admitted to the cardiothoracic surgery department to test the feasibility and clarity of the tools. Those patients who were involved in the pilot study were excluded from the study, because some modifications were done. Establishing the tool's applicability, looking for issues that can impede data collection, and estimating the amount of time required to finish the study were the three main goals of the pilot study.

Ethical Consideration:

The research approval was obtained from the ethical committee of faculty of nursing before starting the study (29/ 1/2023). The head of the cardiothoracic surgery department and outpatient clinic at Assiut University Heart Hospital and the dean of the faculty of nursing all provided formal permission and consent prior to the conduct of the pilot study and the main study after being informed of the nature and goal of the research. The researchers clarified aim and purpose of the study to patients. A patient code was used instead of patient's name. The research study caused no harm to patients. A written consent was obtained. Participants in the study are informed that they are free to decline participation and/or leave the study at any moment, for any reason. Patient privacy during data

collection was considered and maintained by the researchers. The researchers guaranteed the confidentiality and privacy of the study participants' data.

Fieldwork description

Data were collected at the cardiothoracic surgery department and outpatient clinic at Assiut University Heart Hospital during morning and afternoon shifts in duration of eleven months between the start of February 2023 and the end of December 2023.

Procedure

The present study proceeded using the following phases:

Assessment phase

This started in the preoperative phase. The day before surgery, the researchers met with eligible patients, the control and study groups. Each patient in the two groups was informed about the purpose and nature of the ongoing study, and their consent was obtained. All patients' assessments were set up to gather baseline data as demographic and health related data using tool (I), quality of life using tool (II) and symptoms using tool (III).

Depending on the patients' response, the study tools filling process took an average of 20 to 30 minutes.

Planning phase

The protocol of exercise was designed by the researchers based on the study subjects' assessment and extensive reviews of related literature. The researchers prepared instructional materials, and media (photos& video,

handouts, and exercise protocol power point). Training area was set. Additionally, the researchers organized the teaching schedule based on the contents of the educational booklet and time availability.

Implementation phase

Researchers conducted interviews with each patient with one family member or care provider present to assist patient. Exercise protocol is tailored individually according to the clinical condition of patient. Patient ability to perform exercise and engaging in exercise protocol was assessed by ability and fitness test by talking and walking at the same time, and the patient's ability must reach a point where he or she is not suffering from respiratory distress. Also All patients were closely monitored under the supervision of a multidisciplinary team, and the cardiac surgeon made the decision to discontinue or continue the exercise protocol based on the patient's condition.

The study group's patients received an exercise protocol with illustrated images designed by the researchers, along with standard hospital instructions while the control group's patients received only the standard hospital instructions without any exercise protocol.

Exercise protocol

It was developed by researchers based on reviews of literature (**Kubitz et al., 2020, Chen et al., 2021, Xue et al., 2022, and Sibilitz et al., 2021)** accessible resources, the researchers created an exercise protocol in simplified Arabic language, supported by photo illustrations. The exercises were appropriate upper and lower body stretching and flexibility exercises that promote mobility. These exercises are not intended to be a difficult workout for heart. These exercises will speed recovery. They will prevent pain from developing in shoulders

and trunk. They will also help with breathing.

The study group patients received "3 sessions daily" through hospitalization; in morning and afternoon shifts. Researchers started teaching exercises to patient the day before surgery and started in applying it in 1st postoperative day.

First session: the researchers emphasized on the exercise protocol objectives and their relation to improving patients reported outcomes as symptoms and quality of life at the start of this session. It included instructions for the preparation of exercises (before starting exercises) as

- Exercises must be performed the 1st day after surgery and do them daily during recovery.
- Complete most of the exercises in a sitting position. Sit upright looking straight ahead with chin tucked and shoulders pulled back.
- Patient should roll onto side before sitting when getting out of bed.
- Patient must not perform exercise immediately after eating, wait between half an hour and two hours and do not drink alarms (coffee, tea, or soda).
- Wear comfortable clothes and shoes.
- Non-exercising in a very hot or cold atmosphere.
- The patient must breathe naturally during the exercise, (breathe deeply).
- Training must continue on a daily basis for 4 - 6 weeks after surgery.
- Stop training if the patient feels chest pain, nausea, stress, shortness of breath, dizziness, failure or a severe increase in heartbeat.
- The patient is prohibited from lifting anything weighing more than 4 kg and from paying heavy items or performing harsh or sudden exercises in addition to the sudden transfer from the bed, which affects the health of the cardiac muscle. Time required for this session was 20 to 30 minutes.

Second session: In this session exercises were implemented through demonstrations, and re-demonstrations which were chosen as teaching techniques.

Early bed activities began on the first postoperative day, once the patient was out of the acute-danger period, the condition was stable, and contraindications were ruled out. In order to help the patient move from a semi-sitting to a sitting, independent sitting, and bedside sitting position, researchers increased the angle of the patient's bed head. Researchers encouraged patients to perform:

- Diaphragmatic breathing, diaphragm muscles could be strengthened through this exercise (assignment after training session: 5sets/day, 15 repetitions each set following 2-3 min rest for three sets).
- Effective coughing techniques (assignment after training session: 5sets/day, 15 repetitions each set following 2-3 min rest for three sets) and spirometer exercises.

Exercise techniques performed on the basis of protecting the patient’s wound.

The intensity of activity was adjusted according to the patient’s heart rate, blood pressure, oxygen saturation, and respiratory rate. Time required for this session was 30 to 40 minutes.

Third session:

Functional training exercises: started in the first day after surgery, patients were instructed to perform passive or active limb activities in bed and then gradually transitioned from active limb activities in the

bed to bedside activities, starting just by sitting in a chair or walking around the room. Later, there was a short walk in the corridor and, eventually, stair climbing and brisk longer walks to prepare for home. Patient's exercise time is increased and the patient's symptoms, signs, were closely monitored during the exercises.

Shoulder joint and upper and lower body exercises training:

Patients were instructed to perform these exercises when they had fully regained the mobility in shoulders and trunk. Patients performed these exercises twice a day and repeating each exercise 10 times in this sequence (shoulder shrugs- shoulder circles, shoulder lift, shoulder loop, and head wraparound movements). After having full motion in shoulder and sternal wound is stable the patient can progress strengthening exercises as (trunk twists, trunk side bending, stretching of the chest, forward arm raise, side arm raise, backward reach and hands behind back and reach). Lower extremities range of motion exercises as foot and leg exercises to prevent clot formation.This session took 30 to 40 minutes to complete.

In each education session, the patient was asked to repeat the contents to ensure that they had mastered these techniques. The study group patients were instructed to follow the instructions. The researchers developed instructional videos, and informative images as teaching aids. Furthermore, a colored a hard booklet in plain Arabic was given to the patients at the end of sessions to aid patients in assimilating and updating the supplied information.

Before discharge patients instructed that once they were at home, they should continue with the level of activities that had started in hospital. Aim to progress their activity gradually over the weeks and months ahead.

Phase III: Evaluation Phase:

During this phase, evaluation of each patient was done twice. First evaluation was performed after one month (posttest) and again after three months (second evaluation). During the first interview, the researchers take phone number of patient or relative and conducted phone call with patients to ascertain from adherence of patients with exercises and before time of follow up the researchers called them to remind them with time of appointments at hospital and emphasized on importance of follow up for proper evaluation. It was conducted at the cardiothoracic surgery outpatient clinic. Patients were assessed using the Tools II and III to determine how exercise protocol affected their quality of life and symptoms.

IV: Statistical design:-

Statistical Package for Social Sciences (SPSS) V.26 was used to organize, categorize, code, tabulate, and analyze the acquired data. Categorical variables were described by number and percent, where continuous variables described by mean and standard deviation. Chi-square test used to compare between categorical variables. One way ANOVA test (F) used to compare between continuous variables. A two-tailed ($p < 0.05$) was considered statistically significant.

Table (1): Displays that; about one third of the study group patients (30%) and one third

of the control group patients (33.3%) their age ranged from (40-50 years) with a mean age 41.70±12.54 years old for study group patients and 44.80±11.71years old for control group patients. Slightly greater than more half of patients in study group (53.3%) and nearly three fourths control group (70%) were male. The majority of patients in both groups were married (76.7%, 80%) respectively. As regard residence, two thirds of both groups live in rural areas. As regarding to level of education, more than half of both groups had secondary school education. As regard occupation more than two thirds of study group (70%) and more than half of control group (56.7%) had no work. Regarding smoking nearly two thirds of study group patients (60%) and more than half (53.3%) of control group were nonsmokers. More than one third of the study group patients (36.7%) and about one half of the control group patients (46.7%) their body mass index states overweight. There was not a statistically significant difference between both groups as regarding demographic data.

Table (2): Illustrates that, as regarding type of heart valve disease one third of the study and control group patients (33.3%) had mitral regurgitation. About half of study group (43.3%) and over one half of control group (56.7%) had undergone mitral valve replacement. All patients made open heart. Also mechanical valve was used in all valve replacement patients. Almost half of the study group patients (43.3%) and one half of the control group patients (50%) had diabetes mellitus. More than two thirds of study and control group (73.3% & 76.7) respectively had hypertension. There was not a statistically significant difference between both groups regarding medical history.

Table (3): Clarifies that, there was no statistically significant difference between study and control group patients regarding physical domain with statistically significant difference regarding emotional domain of heart QOL questionnaire pre implementation of exercise protocol. There was highly statistically significant difference between study and control group patients regarding global score of heart QOL questionnaire after one month and after three months post implementation of exercise protocol (p value <0.001**).

Table (4): Denotes that, there was a statistically significant difference between both groups regarding overall score of Edmonton Symptom Assessment System (ESAS-r) pre exercise protocol implementation. There was highly statistically significant difference between both groups regarding overall score of Edmonton Symptom Assessment System (ESAS-r) after one month post implementation of exercise protocol and after three months (p value <0.001**).

Table (5): Shows no significant correlation between most items of demographic &medical data and health related quality of life in study and control group. There was significant correlation between educational background and quality of life pre exercise protocol while after it there was no significant correlation. There was significant correlation between occupation and quality of life after exercise protocol.

Table (6): Clarify that there was no significant correlation between most items

of demographic, medical data and symptoms in study and control group. There was significant correlation between smoking, type of operation and symptoms after exercise protocol in study group.

Figure (1): Illustrating a highly statistically significant negative correlation between QOL and ESASr

for study group before exercise protocol while after one month and three months there was no significant correlation**.**

Figure (2): Illustrating no significant correlation between QOL and ESASr for control group before exercise protocol while after one month and three months there was statistically significant correlation

Table (1): Frequency and percentage distribution of the studied patient's demographic and health related data (N=60).

Demographic and health related data	Study		Control		X^2	P. value
	No	%	No	%		
Age						
18> 30 years	6	20.0	3	10.0	1.27	0.866
30>40 years	6	20.0	7	23.3		
40>50 years	9	30.0	10	33.4		
50>60 years	6	20.0	6	20.0		
60 -65 years	3	10.0	4	13.3		
Mean±SD(range)	41.70±12.54 (20-64)		44.80±11.71(20-65)		T=1.71	0.088
Gender						
Male	16	53.3	21	70.0	1.76	0.288
Female	14	46.7	9	30.0		
Marital status						
Single	7	23.3	6	20.0	0.10	0.754
Married	23	76.7	24	80.0		
Residence						
Urban	9	30.0	10	33.3	0.04	0.850
Rural	20	66.7	20	66.7		
Education						
Secondary school	18	60.0	16	53.3	5.75	0.124
University	8	26.7	14	46.7		
Illiterate	3	10.0	0	0.0		
Read and write	1	3.3	0	0.0		
Occupation						
Employed	8	26.7	13	43.3	2.61	0.271
Not employed	21	70.0	17	56.7		
Retired	1	3.3	0	0.0		
Smoking						
No	18	60.0	16	53.3	0.27	0.795
Yes	12	40.0	14	46.7		
BMI						
Underweight	0	0.0	1	3.3	6.11	0.296
Normal weight	8	26.6	5	16.7		
Overweight	11	36.7	14	46.7		
Obese class I	9	30	8	26.6		
Obese class II	0	0.0	2	6.7		
Obese class III	2	6.7	0	0.0		

Chi square test for qualitative data between the two groups *Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (2): Frequency and percentages distributions of the patients among the study and control groups (N=60) based on medical data.

Medical data	Study		Control		X^2	P. value
	No	%	No	%		
Type of heart valve disease						
Mitral valve regurgitation (MR)	10	33.3	10	33.3	5.40	0.249
Aortic valve regurgitation (AR)	7	23.3	3	10.0		
Mitral valve Stenosis (MS)	6	20.0	10	33.3		
MS +AR	4	13.3	1	3.3		
AR+MR	3	10.0	6	20.0		
Type of operation						
Mechanical valve replacement					3.70	0.593
Aortic valve replacement	6	20.0	3	10.0		
Mitral valve replacement	13	43.3	17	56.7		
Aortic + Mitral valve replacement	3	10.0	5	16.7		
Valve repair						
Mitral valve Repair	3	10.0	3	10.0		
Aortic valve Repair	1	3.3	0	0.0		
Aortic + Mitral valve Repair	4	13.3	2	6.7		
Operation Technique						
Open heart surgery	30	100.0	30	100.0	-	-
Closed heart surgery	0	0.0	0	0.0		
Diabetes	13	43.3	15	50.0	0.27	0.605
Hypertension	22	73.3	23	76.7	0.09	0.766

Chi square test for qualitative data between the two groups
*Significant level at P value < 0.05, **Significant level at P value < 0.0

Table (3):- Comparison between study and control group patients related to Heart QOL questionnaire (Pre exercise protocol, after one month and after three months) (n=60).

Heart QOL questionnaire domain	Study	Control	Mean DF	T	P. value
	Mean ±SD	Mean ±SD			
Pre					
Physical domain	3.77±1.68	3.3±2.35	0.47	0.89	0.380
Emotional domain	1.7±0.88	1.1±0.88	0.60	2.64	0.011*
Global score	5.47±1.98	4.4±2.92	1.07	1.66	0.103
After one month					
Physical domain	17.73±1.87	13.2±2.35	4.53	8.25	<0.001**
Emotional domain	7.1±0.84	5.13±0.94	1.97	8.54	<0.001**
Global score	24.83±2	18.33±2.93	6.50	10.04	<0.001**
After three months					
Physical domain	29.5±0.94	23±2.39	6.50	13.85	<0.001**
Emotional domain	11.7±0.7	9.03±0.89	2.67	12.88	<0.001**
Global score	41.2±1.42	32.03±2.86	9.17	15.72	<0.001**

-Independent T-test quantitative data between the two groups
*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (4):- Comparison between study and control group related to ESAS-r during 3 Phases (Pre exercise protocol, after one month& three months) (n=60).

Symptoms	Pre			After one month			After three months		
	Study	Control	P. value	Study	Control	P. value	Study	Control	P. value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Pain	8.53±0.94	9±0.64	0.028*	5.03±1.03	6.27±1.08	<0.001**	0.2±0.41	1.77±0.97	<0.001**
Tiredness	8.17±0.91	8.37±0.61	0.324	4.83±1	5.87±1.01	<0.001**	0.4±0.5	1.8±0.76	<0.001**
Drowsiness	6.57±2.53	8.27±0.78	0.001**	5±1.2	5.8±1.03	0.008**	3.13±4.31	1.8±1.06	0.105
Nausea	7.97±0.85	8.4±0.62	0.028*	4.83±1.05	5.83±1.02	<0.001**	0.1±0.31	1.57±0.97	<0.001**
Lack of Appetite	8.13±0.68	7.8±0.81	0.089	4.6±1.07	5.14±0.95	0.046*	0.2±0.41	1.37±0.96	<0.001**
Shortness of Breath	8.93±0.52	8.83±0.53	0.464	5.07±1.08	6.13±0.9	<0.001**	0.03±0.18	1.77±0.77	<0.001**
Depression	8.43±0.82	8.5±0.63	0.725	4.67±0.99	5.6±0.93	<0.001**	0.13±0.35	1.27±0.64	<0.001**
Anxiety	8.7±0.79	8.57±0.63	0.473	4.9±1.32	5.93±0.94	0.001**	0.13±0.35	1.47±0.86	<0.001**
Wellbeing	6±2.97	8.13±0.68	0.000**	5.1±1.4	5.57±0.9	0.134	3.37±4.57	1.17±0.59	0.011*
Other Problems	8.13±0.73	7.8±0.85	0.108	4.6±1.16	4.86±0.95	0.349	0.37±0.56	1.2±0.89	<0.001**
Overall ESAS-r	**79.57±6.08**	**83.67±4.25**	**0.004****	**48.3±7.05**	**56.67±6.1**	**<0.001****	**8.07±8.25**	**15.17±6.64**	**0.001****

-Independent T-test quantitative data between the two groups

****Significant level at P value < 0.05, **Significant level at P value < 0.01***

Table (5):- Correlation Co-efficient between Heart QOL with patient demographic and medical data (Pre exercise protocol, after one month and three Months) (n=60)

Correlations		Heart QOL					
		Study			Control		
		Pre	Post	Follow Up	Pre	Post	Follow Up
Age	r	-0.107	-0.022	0.120	0.102	0.110	0.203
	P	0.574	0.906	0.528	0.592	0.562	0.283
Gender	r	-0.328	-0.057	-0.038	0.086	0.177	0.070
	P	0.077	0.766	0.841	0.651	0.350	0.714
Marital	r	-0.111	-0.087	0.079	-0.075	0.000	0.065
	P	0.560	0.648	0.679	0.692	1.000	0.732
Residence	r	-0.105	-0.129	0.249	-0.025	-0.115	-0.117
	P	0.582	0.496	0.184	0.897	0.546	0.537
Level of education	r	.380*	-0.220	-0.291	0.265	0.193	0.179
	P	0.038	0.244	0.119	0.156	0.306	0.344
Occupational	r	0.182	0.268	.452*	0.028	0.148	0.010
	P	0.335	0.153	0.012	0.883	0.435	0.957
Smoking	r	0.119	-0.207	-0.117	-0.130	-0.132	-0.059
	P	0.531	0.271	0.539	0.492	0.488	0.758
BMI	r	0.105	-0.021	-0.064	0.095	0.111	0.254
	P	0.580	0.911	0.739	0.618	0.560	0.175
Type of heart valve disease	r	0.308	0.167	0.168	0.229	0.192	0.253
	P	0.098	0.377	0.375	0.223	0.310	0.177
Type of operation	r	0.232	-0.029	-0.206	-0.113	-0.141	-0.080
	P	0.217	0.880	0.274	0.553	0.456	0.676
Diabetes	r	-0.071	-0.199	-0.221	-0.116	-0.093	-0.083
	P	0.707	0.291	0.241	0.541	0.626	0.663
Hypertension	r	-0.010	-0.166	0.086	-0.253	-0.210	-0.106
	P	0.957	0.381	0.651	0.178	0.266	0.579

Table (6):- Correlation Co-efficient between Overall ESAS-r with patient demographic and medical data (Pre exercise protocol, after one month and three Months) (n=60).

Correlations		Overall ESAS-r					
		Study			Control		
		Pre	Post	Follow Up	Pre	Post	Follow Up
Age	r	0.120	0.044	-0.196	0.183	0.204	-0.119
	P	0.526	0.818	0.298	0.334	0.280	0.531
Gender	r	0.079	-0.233	-0.271	-0.070	-0.267	-0.039
	P	0.678	0.215	0.147	0.715	0.154	0.838
Marital	r	-0.106	0.217	-0.015	0.279	0.305	0.026
	P	0.577	0.249	0.938	0.135	0.101	0.894
Residence	r	0.123	-0.003	-0.183	0.028	-0.016	0.115
	P	0.518	0.987	0.333	0.882	0.934	0.543
Level of education	r	-0.284	0.125	0.214	-0.101	-0.015	-0.055
	P	0.128	0.511	0.241	0.595	0.938	0.775
Occupational	r	0.146	-0.358	-0.303	0.268	0.030	-0.019
	P	0.442	0.052	0.104	0.152	0.875	0.921
Smoking	r	-0.077	.416*	.446*	-0.133	0.041	-0.055
	P	0.684	0.022	0.013	0.483	0.830	0.775
BMI	r	-0.109	0.143	0.133	0.025	0.223	0.093
	P	0.567	0.450	0.482	0.896	0.237	0.623
Type of heart valve disease	r	-0.114	0.051	0.262	-0.067	0.040	-0.158
	P	0.547	0.790	0.162	0.725	0.832	0.406
Type of operation	r	-0.212	0.189	.417*	-0.334	-0.158	-0.013
	P	0.262	0.318	0.022	0.071	0.405	0.946
Diabetes	r	-0.004	-0.203	-0.264	0.048	0.200	0.066
	P	0.983	0.283	0.158	0.802	0.289	0.728
Hypertension	r	0.108	0.102	-0.172	-0.101	-0.004	0.014
	P	0.571	0.591	0.365	0.597	0.982	0.941

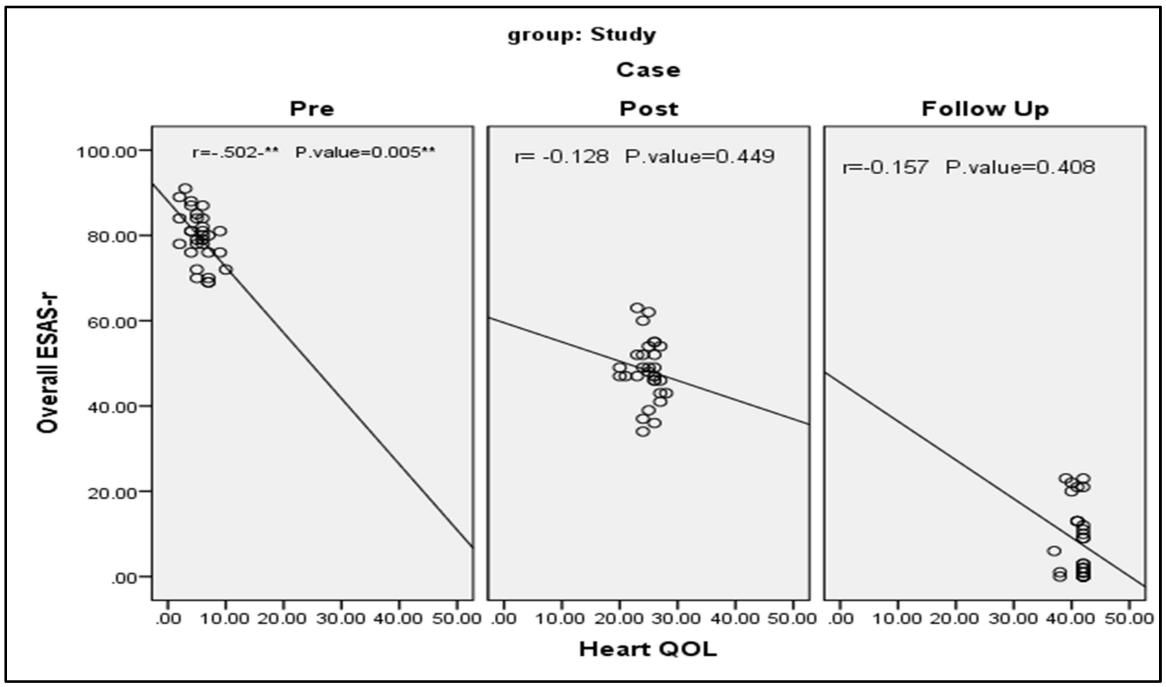

Figure (1): Scatterplot illustrating hypothetical data for the relationship between Heart QOL and ESASr for study group during three protocol phases (Pre- after one month and three months).

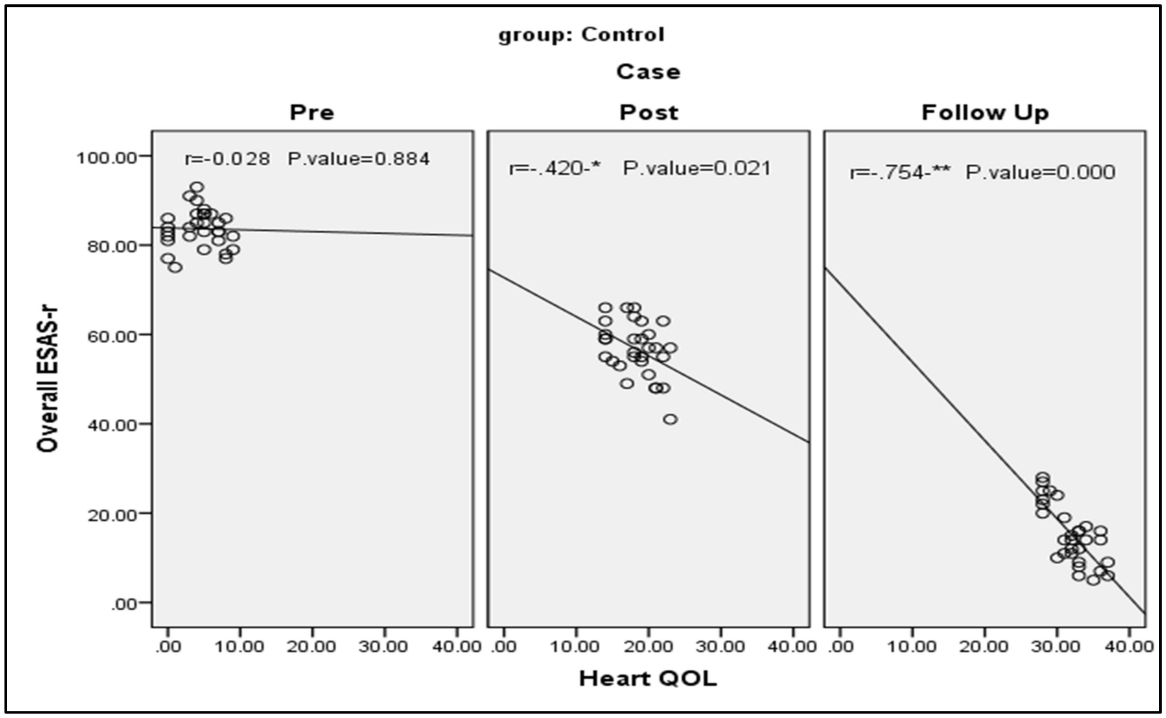

Figure (2): Scatterplot illustrating hypothetical data for the relationship between Heart QOL and ESASr for control group during three protocol phases (Pre- after one month and three months

Discussion

Patient-reported outcome measures have been shown to have substantial predictive significance following several heart procedures **(Alarouri et al., 2023)**. Following heart valve surgery, exercise-based cardiac rehabilitation is recommended and has been demonstrated to have favorable short-term effects on physical capacity. It also has been shown to improve quality of life and functional status in a number of cardiac groups **(Dibben et al., 2021).** This study aimed to evaluate the effect of exercise on PROMS in patients undergoing heart valve surgery.

Regarding demographic features, outcomes of the current study revealed that about one third of patients in each of study and control group their age ranged from forty to fifty years with a mean age 41.70±12.54 years old for study group patients and 44.80±11.71years old for control group patients. From the researchers' point of view, it may be explained that heart disease incidence is increased with increasing age; People who are older are more susceptible to a variety of illnesses and health issues. The outcome aligned with a research study by **Said et al. (2022)** titled "Health related quality of life for patients after mitral valve replacement surgery," which reported mean and standard deviation age values of patients was 41.35 ± 10.33 years, with slightly over one-third of patients falling between the forty and fifty-year age range.

Mahdy and Ali et al., (2014) also in line with current finding as they reported that the highest percentages of patients in both groups their age ranged between forty to fifty years with a mean age 40.38±10.14 years old for intervention group and 41.45±8.77 years old for control group. **Elnahal et al., (2022)** found that the mean age of the patients at time of operative intervention was 45.67± 12.27 years which support current study finding. **Elameen et al., (2018)** added that the mean age of patients undergoing rheumatic valvular surgery was 45.152 years.

Regarding gender the current study cleared that slightly greater than half of patients in study group and nearly three fourths in control group were male. Regarding marital status the existing study discovered that majority of patients in both groups were married. Two thirds of patients were resident in rural areas. Above half of patients in study and control group were secondary educated.

From researchers' point this could be explained by considering that individuals who were married constituted the majority of the study sample, the crucial role of marriage in Egyptian society and religion may be the rationale for this. Regarding residence may be due to lack of research offering health education regarding prophylactic and routine check-ups for early diagnosis of illness causes (such as congenital deformity, rheumatic heart disease, and coronary artery disease) and favorable prognosis. Low socioeconomic position, lack of or decreased follow-up, and low educational attainment of

patients residing in rural areas may be the cause of this outcome, which may result in heart valve disease.

This finding was in accordance an Egyptian study conducted by **Etiwa et al., (2022)** and titled as **"**Factors Affecting Adherence to Therapeutic Regimens among Patients with cardiac valve Replacement" they reported that, most of studied patients were male &married, about half of the studied patients had secondary education and from rural areas.

According to the current study, over two thirds of the patients in the study group and over half of the patients in the control group were non employed. This may be explained by differences in educational attainment, the fact that the majority of the patients in the study did not finish their education, and the fact that they lived in rural areas. This was consistent with the findings of **Said et al. (2022),** who reported that less than two-thirds of the patients under study were unemployed. It was also congruent with earlier findings, which indicated that the majority of the patients under study were married and that two-thirds of the patients were male.

Concerning smoking habit; the present study showed that nearly two thirds of study group patients and more than half of control group were nonsmokers. This was in accordance with a study of **Al-Ebrahim et al., (2023)** who stated that a highest percentage of the patients were male and non-smokers. Also **Luo et al., (2023)** agreed with same study finding as they cleared that slightly more than two thirds of study group patients and more than half of control group were nonsmokers.

The finding concur with previously finding of **Borregaard et al.,(2018)** who reported that nearly two thirds of patients in aortic valve surgery group and more than half of mitral valve surgery group ever smoked.

As regarding body mass index the present study showed that more than one third in study group and nearly half in control group which constitute the highest percentage in both groups were overweight patients. As regarding type of heart valve disease and according to the current study, mitral valve regurgitation affected one-third of the patients. The current study finding clarified that hypertension was documented in more than two thirds of study and control group. According to the researchers, this could be brought on by a higher body weight, which raises blood pressure, a risk factor for heart disease. A major contributing factor to heart disease is high cholesterol, particularly high triglycerides, which is also associated with increased body weight.

These findings were in line with **Xue et al., (2022)** study which evaluated effect of early cardiac rehabilitation in patients undergoing heart valve surgery; their study showed that the highest percentage of patients were in the overweight category of BMI and added that slightly more than one third had primarily mitral valve regurgitation and about two thirds of patients had history of hypertension.

This also was in line with **Said et al., (2022)** who stated that about one-third of patients had operated for mitral

valve regurgitation and most of the studied patients were diagnosed as hypertension.

The current study revealed that half of patients in control group and nearly half of study group had a medical history of diabetes mellitus. Research findings were supported by **Mohammed and Ali (2022**), who showed that the examined sample had diabetes and diabetes combined with hypertension as comorbidities.

The results of this study showed that all patients who underwent valve replacements used mechanical valves, around half of study group and over one half of control group had undergone mitral valve replacement. All patients were performed open heart surgery. According to researchers, this could be explained by the fact that Assiut University Heart Hospital only uses mechanical valves, which may be the best option to reduce the danger of reoperation in advanced instances. This was corroborated by **El Menem et al., (2022)** , who discovered that approximately half of the patients underwent mitral valve replacement and all cases underwent mechanical valve replacement, and by **Ullah et al., (2020)** who reported that ninety four percent of their participants underwent open mitral valve replacement and only six percent underwent transcatheter mitral valve replacement.

Consistent with the present findings, **Holmes and Briffa., (2016)** observed that the majority of patients undergoing cardiac valve surgery had undergone valve replacement.

This was also in agreement with **Kytö et al., (2020)** who stated that mechanical prostheses were used more commonly in younger, male, and less comorbid patients. In accordance with current study finding **Al-Ebrahim et al., (2023)** reported that more than two thirds of patients had a mechanical type of valve.

This result was in agreement with **Chen et al., (2023)**, who revealed that nearly one third of their study participants selected a bio prosthetic valve and nearly three fourths selected a mechanical valve.

The results of the current study indicated that group-related demographic and medical variables did not differ statistically. This indicates that the two groups were homogenous, which supported the idea that the patients under study were similar and protect against selection bias.

As regarding quality of life the current study showed pre exercise protocol; there was no statistically significant difference between study and control group in global score and physical domain but there was significant difference in emotional domain. While a highly statistically significant difference between both groups was documented after one month and three months of exercise protocol. From researchers' point of view this could be contributed to exercise protocol which helped patient to improve their physical capacity and performance which subsequently improved their health related quality of life. From the researchers' perspective, the improvement in patient-reported outcomes measures as quality of life among patients undergoing heart valve surgery following the implementation

of the exercise protocol was evident. These results were supported with the aim and first hypothesis of the present study. This finding was confirmed by **Patel et al. (2021),** who evaluated the implications of an extensive exercise regimen in patients who had undergone mitral valve replacement and had rheumatic heart disease on their quality of life and functional level. They discovered that patients' quality of life was higher in those who expressed greater intent to engage in physical activity and more positive attitudes toward it.

In agreement with the same previous finding **Li et al., (2021)** reported that before their intervention which was phased written health education which contained formulated exercise programs; there was no significant difference in the two groups' quality of life (P>0.05), while the study group's quality of life was consistently higher than the control group's (P<0.05) at all stages of intervention.

This was in alignment with the findings of **Laustsen et al. (2020),** who reported that exercise-based cardiac rehabilitation improved participants' HRQoL over the long and short terms as well as their muscle endurance, strength, and power. **Hao (2022)** conducted a study titled "Enhanced rehabilitation intervention improves postoperative recovery and quality of life of patients after heart valve replacement surgery" and concluded that rehabilitation intervention in patients after heart valve replacement surgery can reduce the incidence of adverse events and postoperative pain and improve the recovery process as well as life quality. His result showed that the observation group experienced a higher life quality than the control group at 1 month after surgery (P<0.05).

Kleczynski et al. (2021) were in line with current study finding as they reported that there was no significant difference in patients' quality of life at baseline while after thirty days and after 6 months there was significant difference between two groups and concluded that improved clinical outcomes and quality of life were linked to cardiac rehabilitation, which included resistance training on a cardiovascular treadmill, functional exercise, and cardiovascular training, for patients having transcatheter valve replacement.

Previous researches have demonstrated that enrollment in a cardiac rehabilitation program is linked to enhanced health status assessments and an improvement in health-related quality of life **Pressler et al., (2016) & Aylor et al., (2019). Long et al., (2019),** shown that exercise-based cardiac rehabilitation has several positive results including reductions in hospitalization and improvements in HRQoL.

The results of the current study, however, were refuted by a prospective, single-center randomized controlled pilot trial that took place from June 2019 to July 2020 at the Center for Preventive Cardiology, Department of Vascular Diseases, Slovenia by **Vitez et al., (2023)** and stated that, with regard to the intervention group, neither health status nor quality of life changed

noticeably over time. With a stability of health status over time and rationalized this result to the COVID-19 pandemic outbreak's effects, which more than offset any gains made possible by the intervention because multiple studies indicated that the pandemic had a negative influence on people's quality of life in general.

Regarding symptoms; the findings of the present study highlighted that there were no significant difference between both groups regarding most symptoms except pain, drowsiness and wellbeing pre exercise protocol. While after one month and three months of exercise protocol there were observable improvement in symptoms with a highly statistically significant difference. From researchers' point of view this could be explained that heart function changes due to valve dysfunction such as reduced cardiac output, stroke volume, and left ventricular ejection fraction had improved after surgery and so patients positively responded to exercise training. So the exercise protocol which had led to improving status of patients and improved symptoms which support second research hypothesis. This was in accordance with **Hao (2022)** who stated that the observation group obtained higher life quality scores but lower pain level, self-rating anxiety score and self-rating depression scores than the control group after one month of intervention.

This finding was in line with **Abraham et al., (2021)** who declared that exercise-based cardiac rehabilitation following heart valve surgery reduced the symptom burden, improved symptom and disease management, and decreased rates of anxiety and depression.

According to **Mohamed Elesawy et al. (2019**), there was no significant difference in the overall mean scores of symptoms experienced by patients before discharge plan; however, following a one-month follow-up, there were statistically significant differences in symptoms such as depression, anxiety, anorexia, fatigue, shortness of breath, and chest/leg pain at p. value (<0.05) between the two groups. These findings are consistent with the study results. Following a three-month period, there was a statistically significant improvement in the symptoms observed by both groups.

Youniss et al., (2019) report of a statistically significant decrease and improvement in fatigue mean score observed among the adult patients under study one month after the implementation of instructional guidelines supported the current study's finding that tiredness was significantly decreased post-exercise protocol.

The findings of current study demonstrated no significant correlation between most items of demographic, medical data and health related quality of life in study and control group. The current study finding supported by study of **Al-Ebrahim et al., (2023)** who revealed that QoL in patients who had valve replacement surgery was unaffected by the patient's age, gender, type of valve, and postoperative complications. But in contrary in reporting that results which

demonstrated the substantial impact of chronic diseases on quality of life, suggested that diabetes and hypertension could be associated with an increased risk of problems following valve replacement surgery. These consequences, which might include bleeding, infections, or issues with the heart or other organs, can have an effect on quality of life. This could be explained by the fact that Westernized eating and lifestyle practices have expanded throughout the Saudi population, making these characteristics more prevalent.

Additionally, **Said et al., (2022)** research revealed no statistically significant correlation between the patients' age, gender, marital status, level of education, and criteria for a high quality of life.

In line with the findings of the current study, **Borregaard et al., (2018)** reported that patients who had mitral valve surgery are not linked to different PROs even though they are younger, have greater educational attainment, and have different co-morbidities. The only factor linked to overall worse patient-reported outcomes at discharge was being female, and this may be explained by the fact that women typically had more advanced valve disease before undergoing surgery.

The results of **Al-Ahdal and Abdullah., (2020)** study on the impact of quality of life on rehabilitation patients after cardiac surgery at Sudan Heart Centre, however, differed from the earlier findings. They found that socio-demographic traits like age, gender, marital status, and educational attainment were more likely to be associated with poor quality of life than other factors related to the surgical procedure.

Education level and quality of life before the exercise regimen were significantly correlated. While after exercises there was no significant correlation. From researchers' point of view this could be attributed that applying exercise protocol which was developed in simple illustrated writing helped the researches to meet various educational needs of patients and also researchers emphasized on all studied patients on adhering to protocol to attain better outcomes which leaded to no significance between various educational levels.

The results of this study aligned with the findings of **Prasankok & Banharak., (2021),** who noted that patients with limited literacy may be less aware of self-care practices, uncertain about them, or uncomfortable and inexperienced in when it comes to asking for medical assistance.

There also significant correlation between occupation and quality of life after exercise protocol. **Framke, et al., (2020)** noted in the context of their study that there is a relationship between an individual's employment and their overall well-being and quality of life for those who undergo heart surgery. This is because work stress may directly contribute to cardiac complications that arise after surgery.

Conversely, with the study result, **Power, et al., (2020)** discovered that patients with greater socioeconomic level and government employees had

higher QOL scores, as reported by some earlier publications.

The current study revealed that no significant correlation between demographic, medical data and symptoms in study and control group. Except there was significant correlation between smoking, type of operation and symptoms after exercise protocol in study group. This could be explained that continued cigarette smoking after a major cardiac surgery predicts worse health outcomes as symptoms.

The findings of the current study were corroborated by **Oshvandi et al., (2020),** who reported a strong correlation between smoking and depression, dyspnea, difficulty sleeping, and leg edema. Smokers had more breathlessness, more trouble sleeping, and more leg swelling.

The findings of the current study contradict those reported by **Ammouri et al., (2016),** who observed a strong correlation between demographic characteristics and symptoms of tiredness, insomnia, and poor appetite.

Arnaz et al., (2017) were in line with the current study. They reported that mitral valve repair seems to be superior to mitral valve replacement in terms of pain scores. Also they found that mitral valve repair was related to decrease thirty days of mortality with a longer survival, and a lower risk of valve-related complications and symptoms.

Fu et al., (2021) concurred with this conclusion and reported that, in the rheumatic population, mitral valve repair surgery is superior to mitral valve replacement surgery in terms of all-cause mortality, valve-related complications, and comparable reoperations during the mid- to long-term follow-up period.

The current study's findings demonstrated a highly statistically significant inverse relationship between study group QOL and ESASr prior to the exercise protocol. While after one month and three months there was no significant correlation as patients who had high symptoms sores had a lower quality of life. For control group; no significant correlation between QOL and ESASr before exercise protocol while after one month and three months there was statistically significant correlation**. Azari et al., (2020)** outlined how symptoms such as dyspnea, exhaustion, syncope, and palpitations appear when heart valve disease worsens. When heart valve disease appears, it significantly reduces quality of life and ability to do everyday tasks, necessitating heart valve surgery. There have been reports of successful procedures, quicker recovery times, and positive short-term clinical outcomes. From researchers view the explanation of this due to the implementation of exercise protocols which helped in minimizing and properly address these symptoms which in turn improved quality of life.

In the same direction, **Blokzijl et al., (2021)** supported the results of the current research, showing that patients frequently develop chest pain, growing exhaustion, syncope, and heart failure as the severity of valve disease increases. Because of the incapacity to engage in regular activities, these

symptoms cause a decline in quality of life (QoL). If they don't receive treatment, Patients who eventually become symptomatic face a prognosis of up to 50% mortality within 2 years, if left untreated. Along with symptom relief and increased survival, quality of life (QoL) is a critical outcome following valve replacement.

Conclusion

The current study concluded that after implementation of exercise protocol, quality of life and symptoms were significantly improved for the study group than control group of patients.

Recommendations

1. A simplified illustrated and comprehensive Arabic booklet (Exercise protocol) including information about cardiac valve surgery, exercises and lifestyle changes for positive adherence among patients post cardiac valve surgery should be available at Cardiothoracic surgery department in Assiut University Heart Hospital as teaching guide for patients.
2. Whats-App program or telenursing is recommended for follow up to ascertain from compliance of patients with guidelines.
3. Further research using a more representative population is required in order to verify these results.
4. Future research should focus on long term effect of rehabilitation after cardiac valve surgery.

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