Evidence Based Exercise and Early Mobilization Effectiveness on Post Cardiac Surgeries Physiological and Psychological Outcomes

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Abstract

Early ambulation of patients had cardiac surgeries on first post-operative days is recommended as in many studies evidence, furthermore performing different range of motion exercises and changing patients' positions are very essential nursing interventions required to enhance patients' outcomes and prevent post cardiac surgery complications. **The purpose of the study:** to evaluate evidence based exercise and early mobilization effectiveness on post cardiac surgeries physiological and psychological outcomes. **Design: Quasi Experimental design. Setting:** Intensive cardiac care unit at Menoufia University and Shebin El- kom Teaching Hospitals. **Subject:** A convenience sample of 100 adult patients of both sexes undergoing different cardiac surgeries. **Instruments:** Three instruments; as follows: Instrument one: Cardiac surgery patient's profile data; Instrument two: Post cardiac surgery outcomes assessment record and Instrument three: Visual analogue pain scale. **Results**: there was a significant difference between study and control group regarding to physiological outcomes; as respiratory rate, heart rate, temperature, blood pressure, central venous pressure and pain; otherwise there was a significant difference between study and control group regarding to psychological outcomes as anxiety and depressive symptoms. **Conclusion:** the result of the current study approved that evidence exercise and early mobilization after cardiac surgeries attributes significant positive effect on patients' psychological and physiological outcomes. **Recommendations:** The present study recommended that; warranted through a multidisciplinary perspective to identify all barriers against patient mobility and translate the evidence to practice for final global improvements in patients' outcomes.

Keywords: Exercise and Early Mobilization, Physiological and Psychological Outcomes, Post Cardiac Surgeries.

1. Introduction

Cardiac surgeries (CSs) commonly performed to lessen patients' complains, enhance their prognosis, and improving cardiac functional capability. Although technological advancement and accurate perioperative preparation for cardiac surgeries; occurrence of post-operative problems are still; these problems decline patients' physiological and psychological status, which have a negative influence on patients, family and community (**Pretorius, & Frans 2017**).

Cardiac surgeries are more unstable than other surgeries, and patients who had cardiac surgery coming out of the operating room with numerous kinds of catheters, lines, chest tubes and they should be admitted into intensive care unit because instability of their hemodynamic status (**Ahmed, 2019 & Chen, et al., 2020**) reported approximately 58% of patients with cardiac surgeries frequently have post-operative complications as sternal pain, pulmonary function lowering, these complications lead to extended duration of hospitalization and diminishing in physical mobility with high morbidity and mortality rates (**Nachiyunde & Lam, 2018**). These complications may lead to a prolonged staying of patients in the ICU and a reduction in their mobility (**Torres, et al., 2017**).

Although the advancements in the technique of cardiac surgeries, pain is still the chief complain among cardiac surgery patients. Around 47% to 75% of patients report post cardiac surgery pain. It interferes with ventilation, coughing and deep breathing, so decreasing the removal of secretion from the

respiratory tract, decreasing vital lung and functional residual capacity, leading to atelectasis and respiratory infections, among other results (**Öğüt and Dağ 2019**).

Furthermore anxiety and depression are still common psychological complications after an acute cardiac experience. Anxiety may activate sympathetic nervous system, which cause different physiological reactions as rising of blood pressure, increasing in heart rate, cardiac output, oxygen consumption, changed blood coagulability. Also anxiety and depression increasing possibility of immunity depression and mortality rates (**Zaouter, et al., 2019 & Murphy, et al., 2020**).

Ambulation of cardiac surgeries patients on first post-operative days recommended from many evidence of studies, otherwise changing patients' positions as upright and sitting position with performing different range of motion exercises (ROMs) to prevent post cardiac surgery complications; which increasing load on patients, besides their families and communities (**Tariq, et al., 2017 & Pretorius,& Frans 2017**).

Recently several organizations took serious steps toward set up decisions and established protocol of application of evidence-based intervention, which became very essential method in health profession, which allowing to get to provide a standardized nursing care and enhanced quality of care for patients (**Yaylaand and Özer, 2019**).

Patients after cardiac surgeries usually immobilized due to the major operation, so many problems arising. Recently, applying new trends of evidence based early mobilization and personalized exercise, directed to improve patients' physiological status as pain, hemodynamic stability and oxygenation rather than the psychological outcomes as reducing sense of restless, anxiety and depressive symptoms (**Nachiyunde and Lam, 2018**).

Finally; nurses play a necessary role in avoiding immobility problems by performance of efficient nursing interventions as encouraging patients for early mobilization, changing position, educate and train cardiac patients' on active/ active assistive exercises depended on each patient's ability, all these interventions improve patients' outcomes (**Castelino, et al.,2016**).

Significance of study:

Bed rest is part of post-operative necessities without attention of muscular weakness, which may arises. Patients' survival are the main focus of critical care nurses and they should encourage cardiac surgeries patients' mobility by appropriate moving, taking precautions when help patients get up their beds with ensuring safety measures to prevent disconnection of lines, drains and catheters (**Ahmed, 2019**).

Many studies as **Miwa, et al., 2017 and Akram, & Hegazy, 2020**; recommended early ambulation and performing physical based exercises after cardiac surgeries for their benefits and prevent inactivity problems.

On other hand although all these recommendations of studies and literature; there is no research has been done about the effect of evidence based exercise and early mobilization on post cardiac surgeries physiological and psychological outcomes in Menoufia University teaching hospitals.

Purpose of the study: The study aimed to evaluate evidence based exercise and early mobilization effectiveness on post cardiac surgeries physiological and psychological outcomes.

Hypotheses:

- Patients who undergo evidence exercise and early mobilization-based intervention will exhibit improved physiological outcomes.
- Pain, anxiety and depressive symptoms will decrease among patients who undergo evidence exercise and early mobilization-based intervention.

2. Methodology

Research design:

A quasi-experimental research design was utilized to conduct the existing study.

Setting:

The study was conducted in the intensive cardiac care unit at Menoufia University and Shebin El- kom Teaching Hospitals.

Subjects:

A convenient sample of 100 adult patients from both sexes undergoing cardiac surgery was included in the study as indicated by the (Epi-info) power analysis. Patients admitted to ICU, after cardiac surgeries, agreed to participate in the study and fulfill the inclusion criteria. The study subjects were divided randomly and alternatively into two equal groups 50 patients in each as follows: 1-The study group (I): received their care provided by the researchers through evidence exercise and early mobilization based intervention plus routine hospital care; 2- The control group (II): received only routine hospital care.

Inclusion criteria: a) Adult patients from both sex if available, b) Patients' staying in ICU for at least 5 days. c) Hemodynamically stable patients' had safety criteria for mobility of patients' readiness; it included:

1. **Myocardial stability** such as HR: 60-120 b/min, SBP>90 <200 mmHg, no active bleeding, no dysrhythmias need to administration of a new anti-dysrhythmic agent (2hrs) and absence of myocardial infarction.
2. **Oxygenation adequacy** such as RR < 35 b/min, $Fio_2 \leq$ 60%,positive end expiratory pressure(PEEP) $\leq$ 10 cmH_2o, $Sao_2 \geq$ 90%
3. **Vasopressor** "minimal dose", no increase in vasopressor dose infusion for at least 2 hours.

Exclusion criteria: a) Not willing to participate in the study. b) Have a history of mental disorders. c) Receiving high inotrope titration after 4 hours of operation. d) Having delayed ventilation weaning (more than 6 hours postoperatively) or on opiate sedation. e) Having activity intolerance, liability of bleeding, fluid and electrolytes imbalance and fever. f) Patients with unstable chest pain, systolic blood pressure > 200 mmHg, diastolic blood pressure >100 mmHg, acute systemic illness, uncontrolled tachycardia and bradycardia.

Instruments of the study: Three instruments were developed to collect the current data; as follows:

Instrument one: Cardiac surgery patient's profile data; this instrument was developed by the researcher after reviewing the relevant literature (**Brustia, et al., 2018, Asgari, et al., 2015**) to assess post cardiac surgery patients' readiness and safety criteria before applying early physical activity, it consists of two parts:

Part I: Patient's Socio-demographic data which includes: patient's age, sex, marital status, educational level, and smoking history.

Part II: Patients' medical, surgery type and clinical data as:

a) **Comorbidity** includes hypertension, diabetes mellitus, renal insufficiency, chronic obstructive pulmonary disorders (COPD) and others.
b) **Anthropometric measurement;** it includes measure weight and height then calculate the body mass index (BMI) according to **Malcolm Kendrick (2015**).
c) **Type of cardiac surgeries:** as mitral valve replacement (MVR), aortic valve replacement (AVR), congenital repair (CR), double valve replacement (DVR) and coronary artery bypass graft (CABG).

Instrument two: Post cardiac surgery outcomes assessment record; this instrument was developed by the researcher after reviewing the relevant literature (**Tariq, et al., 2017, Ahmed 2019, & Chen, et al., 2020**) to assess the patients' outcomes after implementation of early physical activity. It includes two parts as follows:

Part I: Physiological outcomes record includes vital signs (HR, SBP, DBP and Temp.), CVP and SaO^2.

Part 2: Psychological outcomes record includes anxiety and depressive symptoms by using hospital anxiety and depression scale (HADS) was developed by **Woods, et al., 2016** to assess symptoms of anxiety and depression among the included patients. It comprises seven questions for anxiety and seven questions for depression and takes 2–5 min to complete. For both scales, scores of less than 7 indicate non anxiety or depressive symptoms, 8–10 indicate mild anxiety or depressive symptoms, 11–14 indicate moderate anxiety or depressive symptoms, 15–21 indicate severe

anxiety or depressive symptoms. The response format measured on dichotomous scale of Yes (present) and No (not present) depending on whether the patient has fulfilled each criterion or not.

Instrument three: Visual analogue pain scale (VAS): It was developed by **Taman et al., 2018**, to assess the level of patients ' pain intensity. The measurement was from zero to ten as follows: 0 = no pain, 1-3, mild pain, 4-6 = moderate pain, 7- 10 = sever pain**.**

Scoring system

(1) BMI according to **Malcolm Kendrick (2015**); it includes six classifications as follows: underweight; BMI is 18.5 and Less than, normal; BMI is 18.5-24.9, pre-obese; BMI is 30-34.9, Obese class I; Obese class II; BMI is 35-39.9, and Obese III; BMI is 40 and more.

(2) Hospital anxiety and depression scale (HADS). It comprises seven questions for anxiety and seven questions for depression. For both scales, scores of less than 7 indicate non anxiety or depressive symptoms, 8–10 indicate mild anxiety or depressive symptoms, 11–14 indicate moderate anxiety or depressive symptoms, 15–21 indicate severe anxiety or depressive symptoms. The response format measured on dichotomous scale of Yes (present) and No (not present) depending on whether the patient has fulfilled each criterion or not.

(3) Pain grading total score ranged from (0-10) grade. As following; 0 means no pain; from (1-4) grade means mild pain; from (5-6) grade moderate pain and from (7-10) grade means severe pain.

Validity of the tools:

All tools were tested for its content validity by two experts in the field of medical surgical nursing, two experts in the field of critical care nursing and two experts in the field of psychiatric health nursing, Faculty of Nursing, Menoufia University. Modifications were done accordingly.

Reliability of tools:

Reliability was estimated among ten of participants by using test retest method with two weeks apart between them. Then Cronbach alpha reliability test was done through SPSS computer package.

Regarding Tool I: Cronbach alpha reliability value was0.78.

Regarding Tool II: Cronbach alpha reliability value was 0.88.

Regarding Tool III: Tool (III): Abd El Gwad Elkalashy & Masry (2018) tested the reliability of tool III and found that the test retest reliability was 0.84.The researchers of present study retested the reliability by Cronbach alpha for this tool value was 0.83.

Pilot study: was done by 10 % of patients before starting the actual data collection to evaluate the effectiveness of the study tools, clarity, techniques and the availability of the study sample; and subjects who participated in the pilot study were not included in the study sample.

Ethical considerations: The official permission to conduct the study was obtained by the researchers from the dean and ethical committee of the Faculty of Nursing after comprehensive explanation of study purpose and data collection procedures. The researchers obtained an official permission from hospital manager, executive of the both hospitals and from head nurse of ICU. All participants who will meet the inclusion criteria will be informed about purpose, procedure, and benefits of the study then an oral consent will be obtained from all participants and their families. Participation in the study will be voluntary and the patients can withdraw from the study at any time without penalty. Confidentiality and anonymity of patients will be assured through coding all data and put all papers in a closed cabinet. The nature of instruments will not cause any physical or emotional harm to participants.

Data Collection and Field work:

Duration of study: Data were collected from February till October 2020.

Procedure:

Postoperatively cardiac surgeries patients who met the inclusion criteria were assessed for safety readiness. After that the researchers explained the study purpose to the participants then obtained their agreement for sharing in the study. The researchers were used part 1 and part 2 of the tool one to collect patients' demographic and clinical data. Then the study group was instructed and trained about the evidence exercise and early mobilization based intervention steps. The physiological parameters were assessed and recorded as a base line data for both groups before implementing the steps of the intervention. It was done for the study group patients who were passed the safety criteria for patients' readiness, using mobility safety (**Baidya, et al., 2016**).

Postoperatively, the study group was encouraged to perform the evidence exercise and early mobilization based intervention steps additional provided care by hospital. However, the control group received the routine hospital care only. Postoperative physiological parameters including vital signs, oxygen saturation, CVP and pain were monitored before and after each physical activity for both groups on the 1st day after surgery.

Each step of physical activity was taken from 5 to 10 minutes. The physiological parameters were recorded before each physical activity step while the patient was on supine position. After each step of evidence exercise and early mobilization based intervention, the patient rested for 5 minutes then the physiological parameters were monitored. Patients progresses to the next step depending on tolerance and functional ability that begin immediately upon stabilization of hemodynamic and respiratory physiology.

The intervention steps were carried out on all patients in study group from the first postoperative day in the "morning and evening shifts "about 2 sessions / shifts in the first five days after cardiac surgery.

The evidence exercise and early mobilization based intervention steps were include range of motion exercise and early mobilization. The 1st step which is placing patient in semi-fowler position; then the 2nd step (ROM) passive exercise of the upper extremities (wrists) and the lower extremities (ankles) 5 sets (10 repetitions) 2 hours post-operative), then the 3rd step (Active-Assistive ROM): Exercises of upper extremities in sitting position (90º) flexion-extension of the wrist, the elbow, and the unilateral shoulder, 2 set (15 repetitions for 15 minutes) and exercises of lower limbs in sitting position (90º) knee and ankle; adduction-abduction of the hips for 15 minutes, then the 4th step which include active exercises in sitting position, 3sets of 15 repetitions for 5 minutes. After that early mobilization start with sitting on edge of bed.

After that the researcher encourages the patients to perform the first early mobilization step (chair sitting 5-10 minutes), then standing, and perform the second mobilization step (walking with assistance in the room as tolerance) (5-10 minutes walking), after that the patient was encouraged for the third mobilization step (walking without assistance as tolerance (5-10 minutes walking).

Physiological outcomes were monitored and recorded using tool one at 5 minutes following completion of each step of evidence exercise and early mobilization based intervention. In addition, safety of all invasive lines and tubes were maintained. If the patient tolerates the exercise and early mobilization for more than 15 minutes after each step with no cardiovascular or respiratory alterations, he/she was followed the next step.

After completion of the exercises, physiological outcomes were re-assessed using part I of the tool two. If the patients in the study group had intolerance or develop any dangerous sign or symptom as symptomatic decrease in MAP, HR <50 or >130 beats per minute for 5 minutes, RR<5 or >40 breaths per minute for 5 minute, systolic blood pressure (SBP) >180 mm Hg for 5 minutes, pulse oximetry reading <88% for 5 minutes, patient distress, and new arrhythmia and new onset of syncope, holding evidence exercise and early mobilization based intervention steps and the patients were excluded relatively until oxygenation and hemodynamic stability occurs and then reassessed to perform the exercise and continue the **previous** steps.

For both groups, physiological outcomes were evaluated and recorded using tool two before discharge, and pain which assessed by using a body chart and associated 10 cm

horizontal visual analog scale (VAS), which had end-point descriptors of no pain and worst imaginable pain.

Psychological outcomes include anxiety and depressive symptoms were assessed using of hospital anxiety and depression scale (HADS) which is a short self-report questionnaire to screen anxiety and depression. It developed especially for hospitalized persons with physical illness. The questionnaire consists of 14 items, 7 questions address anxiety and 7 address depressive symptoms , 4 point (0-3) response range. It takes 2–5 min to complete. For both scales, the researchers wrote scores for each symptoms category. The response format measured on dichotomous scale of Yes (present) and No (not present) depending on whether the patient has fulfilled each criterion or not.

Evaluation and follow-up as follows: the researchers took 3 measurements for evaluating the effectiveness of interventions; first measurement was immediately after operation; the second at 3rd day after operation and the third was in the 5th day after operation. In each measurement, the researchers compare between both groups regarding all their outcomes.

Statistical analysis:

The data were coded and transformed into a specially designed format suitable for computer feeding to use it for statistical analysis. All entered data were verified for any errors. Statistical package for social sciences (SPSS) version 20 were used to analyze the data. Added to that, data were presented in tables and graphs. Types of test included Chi-square test, independent sample t-test, and mean and standard deviations were computed. P-value at 0.05 was used to determine level of significance:

- P-value > 0.05 to be statistically insignificant.
- P-value ≤ 0.05 to be statistically significant.
- P-value ≤ 0.001 to be highly statistically significant.

3. Results

Table (I) presented the most common age for patients in both groups was found to be 60 years and more than half of both groups were male. More than two thirds of the studied sample was employee. More than two thirds of both groups had no smoking history.

Table (2) found that; diabetes mellitus and hypertension were the most common co morbidity in both groups of the study. The most common type of surgery in study and control groups was mitral valve and double valve replacement. More than half of both study and control groups were classified as overweight according to their body mass index.

Table (3) this table showed that; there was a significant difference between study and control group regarding to respiratory rate in the 3rd and 5th post- operative day of the study and also there was a significant difference between study and control group regarding to central venous pressure during all days of the study and regarding to temperature during the 1st and 3rd post-operative day of the study and also there was a significance between study and control group in relation to respiratory rate, central venous pressure and oxygen saturation in the 5th post-operative day of the study. The current study showed that there was no significant difference between study and control group regarding to the heart rate and systolic blood pressure.

Table (4) this table revealed that; there were statistically significant differences between the study and control groups in relation to experience of pain and feeling of anxiety.

Table (5) this matrix revealed that; there was a significant moderate post-operative correlation observed between pain and anxiety where Pearson correlation is 0.589 with p value 0.000. Whereas it also noticed that there is a weak negative correlation noted between anxiety and depressive symptoms (r -0.038, p value 0.706), and finally there was no correlation noted between pain and depressive symptoms (r 0.001, p value 0.995).

Table (6) this table showed that; existence of a significant decreasing in the pain scale in the 5th post- operative day of the study group with p value 0.001. There was also a significant decreasing in the anxiety scale in the 5th post-operative day of the study group with p value 0.005 and a significant decreasing in depressive symptoms in the 5th post-operative day of the study group with p value 0.032.

Table (1): Distribution of Scio-demographic data of studied groups:

Demographic data	Control group		Study group		Test of significance
	No. (50)	%	No. (50)	%	
Age (Years)					
< 30	5	10.0	5	10.0	χ^2:0.088 P:0.999
30 < 40	5	10.0	5	10.0	
40 < 50	13	26.0	12	24.0	
50 < 60	10	20.0	11	22.0	
≥ 60	17	34.0	17	34.0	
Sex					
Male	32	64.0	33	66.0	χ^2:0.044 P:0.834
Female	18	36.0	17	34.0	
Occupation					
Employee	31	62.0	28	56.0	χ^2:0.372 P:0.542
Unemployed	19	38.0	22	44.0	
Smoking					
Smoker	17	34.0	17	34.0	---------
Non-smoker	33	66.0	33	66.0	

χ^2: Chi-square test P: P value of chi-square test * Significance at P ≤0.05

Table (2): Distribution of medical, surgical and clinical related data among studied groups:

Medical, surgical and clinical related data	Control group		Study group		Test of significance
	No. (50)	%	No. (50)	%	
Comorbidity					
Hypertension	8	16.0	9	18.0	χ^2:2.914 P:0.713
Diabetes mellitus	14	28.0	11	22.0	
Renal insufficiency	5	10.0	9	18.0	
COPD	5	10.0	2	4.0	
CNS disorders	7	14.0	8	16.0	
Mixed or others	11	22.0	11	22.0	
Type of surgery					
AVR	10	20.0	6	12.0	χ^2:2.660 P:0.616
MVR	15	30.0	14	28.0	
DVR	15	30.0	18	36.0	
CABG	8	16.0	7	14.0	
CO	2	4.0	5	10.0	
Body Mass Index classification					
Normal	1	2.0	6	12.0	χ^2:4.222 P:0.238
Pre-obese	32	64.0	26	52.0	
Obese class I	16	32.0	17	34.0	
Obese class II	1	2.0	1	2.0	

χ^2: Chi-square test P: P value of chi-square test * Significance at P ≤0.05

AVR: Aortic Valve Replacement, MVR: Mitral Valve Replacement, DVR: Double Valve Replacement, CABG: Coronary Artery Bypass Graft. CO: Combined Operations.

Table (3): Comparison between the study and control groups regarding physiological outcomes:

Physiological outcomes	Control group	Study group	Test of significance	
	Mean ± SD	Mean ± SD	t-test	P value
Respiratory rate (C/min.)				
Immediately after operation	19.6±2.6	19.2±2.5	.762	.448
3rd day after operation	20.7±3.0	19.0±2.3	3.073	.003*
5th day after operation	21.3±3.1	18.0±1.8	6.353	<.001*
Heart rate (B/min.)				
Immediately after operation	89.2±7.6	91.5±7.7	-1.496	.138
3rd day after operation	91.1±7.5	91.4±7.5	-.212	.833
5th day after operation	90.1±7.5	91.4±7.5	-.818	.415
Systolic blood pressure (mmHg)				
Immediately after operation	133.4±6.9	135.9±6.5	-1.853	.067
3rd day after operation	132.6±6.5	130.9±6.6	1.287	.201
5th day after operation	130.4±6.6	130.0±6.6	.300	.765
Diastolic blood pressure (mmHg)				
Immediately after operation	73.8±4.4	77.3±4.5	-3.920	<.001*
3rd day after operation	76.1±4.6	77.0±4.5	-1.008	.316
5th day after operation	73.2±4.3	73.6±4.1	-.400	.690
Central venous pressure (mmHg)				
Immediately after operation	9.2±1.2	8.5±0.9	2.737	.007*
3rd day after operation	9.2±1.4	8.6±0,7	2.328	.022*
5th day after operation	8.9±0.9	8.1±0.9	4.311	<.001*
Oxygen saturation (%)				
Immediately after operation	95.6±1.7	95.2±1.3	1.335	.185
3rd day after operation	95.3±1.3	95.1±1.2	.785	.434
5th day after operation	95.0±1.4	96.0±1.3	-3.616	<.001*
Temperature (°C)				
Immediately after operation	37.0±0.3	37.2±0.3	-2.718	.008*
3rd day after operation	37.0±0.3	37.2±0.4	-1.925	.057*
5th day after operation	37.0±0.4	37.1±0.4	-1.433	.155

T-test: Student t-test P: P value of t- test * Significance at P ≤0.05

Table (4): Comparison between study and control groups regarding the pain and psychological outcomes**:**

Outcomes	Control group	Study group	Test of significance	
	Mean ± SD	Mean ± SD	t-test	P value
Pain				
Immediately after operation	5.3±3.5	5.0±3.4	.371	.711
5th day after operation	5.0±3.4	1.7±2.3	5.686	<.001*
Anxiety				
Immediately after operation	6.3±6.0	6.6±5.8	-.235	.815
5th day after operation	6.5±6.1	3.5±4.6	2.706	.008*
Depressive symptoms				
Immediately after operation	3.4±5.0	3.6±5.1	-.217	.829
5th day after operation	3.5±5.0	2.3±4.3	1.207	.230

T-test: Student t-test P: P value of t- test * Significance at P ≤0.05

Table (5): Pain, anxiety and depressive symptoms correlation matrix in study group:

Item	Anxiety		Depressive symptoms	
	r	P	r	P
Pain	.589**	.000	.001	.995
Anxiety			-.038	.706

R: Pearson Correlation P: P value of Pearson Correlation **: Correlation is significant at the 0.01 level

NB: r<0.2: no correlation. R: 0.2-0.4: weak correlation. R: 0.4-0.6: A moderate correlation r: 0.6-0.8: A strong correlation. R> 0.8: A perfect correlation

Table (6): The mean differences of pain, anxiety and depressive symptoms among study group throughout study period:

Item	Scale results		Test of significance		
	Immediately	After 5 days	F	P	η^2
Pain	5.0±3.4	1.7±2.3	31.324	<0.001*	.857
Anxiety	6.6±5.8	3.5±4.6	8.076	0.005*	.794
Depressive symptoms	3.6±5.1	2.3±4.3	4.760	0.032*	.866

F: Mauchly's Test of Sphericity (Sphericity Assumed / Epsilon (Greenhouse Geisser/Huynh-Feldt)
η^2: *Eta square (Eta square (η^2)* Effect size (small effect η^2= 0.01, medium η^2= 0.06, largeη^2= 0.14)
P: P value of test of significance *: Significant at p value ≤0.05

4. Discussion

Post-operative physiological and psychological complications are common in patients had cardiac surgeries. Personalized patient exercises and early mobilization are recommended to prevent post cardiac complications and achieve successful outcomes in post-operative care. This study aimed to evaluate evidence based exercise and early mobilization effectiveness on post cardiac surgeries physiological and psychological outcomes.

Physiological patient's outcomes:

The current research findings revealed that; heart rates were slightly increased after mobilization than before mobilization in the study group with statistically significant differences throughout the study period. The results of the current study are consistent with **Younis & Ahmed, 2015** who detected a significant increasing in mean score of heart rate after passive exercise among the intervention sample. Additionally, **Asgari, et al., 2015** noticed a significant difference in heart rate during the first and third day of mobilization between the intervention and control groups. On the contrary, **Ahmed, 2019** who reported that; heart rate was slightly increased in hospital care group than early ambulation group with statistically significant differences over time. The researchers explored that; may be due to sympathetic stimulation which manifested by increase of heart rate after physical activity.

Current study revealed that; there was a slightly decreasing in systolic blood pressure after physical activity than before in the study group except in the systolic blood pressure in the first day of physical mobilization with statistically significant differences over time. The result is on contrary to **Ahmed, 2019;** who reported that; rising in systolic blood pressure among activity group than hospital group. The possible explanation for these findings could be due to decrease of wound pain in the study group that has direct effect on hemodynamic readings.

Regarding the diastolic blood pressure, the result of existing study is constant with the result of **Ahmed, 2019 & Hoyer, et al. 2015;** they reported that; diastolic blood pressure of the study group was elevated than hospital group during early activity period with statistically significant differences in diastolic blood pressure over time.

The present study results documented that; central venous pressure reading was decreased after mobilization than before in study group with statistically significant differences throughout the study period. This finding was on the conflicting with **Flynn, et al., 2019** who reported that; an increasing in central venous pressure over their study phases. The researchers explained that; may be due to decrease the venous return to the heart by the effect of gravity and body post-operative changes from supine to standing, gravity pull down the vascular volume so that blood accumulates in the lower extremities and this results in a fall in central venous pressure after mobilization.

The contemporary study result stated that; oxygen saturation decreased in first and third day of mobilization; however it increased in the last day of mobilization with statistically significant difference. This is supported by **Santos, et al., 2017** they reported that; over time of their interventions application there was a significant increasing in oxygen saturation among intervention group who had cardiac surgeries. The researchers explored the decreasing in oxygen saturation in the first and

third day of mobilization may be due to increase in oxygen demand after mobilization, the effect of surgical procedures and wound pain on breathing itself. At the same time the pain decreased over the time with mobilization which consequently affecting on breathing and expansion of the lung and hence affect post-operatively on oxygen saturation.

The ongoing study results also approved that; body temperature was increased after mobilization than before mobilization in the study group with statistically significant differences throughout the study period. This finding is parallel to **Ahmed, 2019** who documented an increasing in body temperature values in both studied groups throughout the study period. The researchers explained that; by the effect of early ambulation on patients' hemodynamic post-operatively and activate the sympathetic nervous system and increasing in metabolism.

The current study revealed that; sternal pain scores increased significantly in control group compared with scores in study group. This result was in line with **Rice, et al., 2019**, who reported a significant lowering in the sternal pain; with more consummation of the exercise intervention compared with patients did not perform the exercises. Additionally **Al Otaibi, et al., 2015**, they reported that; the category of chest pain, decreased after interventions of exercise and early mobilization. The researchers explained the post-operative reasons for the lower levels of pain in the study group were early mobilization. Moreover, the release of peripheral and central beta-endorphins, that have been associated with changes in the pain severity in the study group due to performing the exercise and early mobility.

Psychological patient's outcomes:

It is generally agreed that; one patient in three experience severe anxiety while hospitalized especially after cardiac procedures. Patients who are anxious or depressed after an acute cardiac event are at increased risk of a subsequent event and early life loss **Murphy, et al., 2020**.

The exiting result indicated that; among intervention group, patients' anxiety decreased after pain intensity lowered by implementation of exercises, these findings supported by **Madalina Boitor, et al., 2018**, they stated that; anxiety and stress dropped when pain severity diminished among cardiac surgical patients after nursing interventions as exercises and message.

Regarding feeling of anxiety and depressive symptoms in the current study there was a significant difference was found in the feeling of anxiety which increased in control rather study group moreover the scores of depressive symptoms, increased in control group compared with scores in study group. This is supported by **Caspi- Avissar, et al., 2021** and **Al Otaibi, et al., 2015** they stated that; exercise and early mobilization had psychotherapical effect on cardiac patients so will significantly diminish these symptoms. The researchers explained the anxiety and depressive symptoms more common after cardiac surgeries by the result of hospital environment, beside physical inactivity and lack of support systems, while patients' in ability to return to work or a natural living environment by satisfaction of psychosocial and physical domains to enhance patients' quality of life.

Thereby, the current results supported our research hypotheses stating that, evidence exercise and early mobilization after cardiac surgeries attributes significant positive effect on patients' outcomes.

Limitations to the study

It is well understood that not all hospitals have the obvious resources to provide a trained multidisciplinary team that is able to effectively stratify, prescribe, monitor and progress a personalized exercise and early mobilization intervention.

5. Conclusion

Definitely, significant improvements seen in oxygen saturation levels, central venous pressure and vital signs with rapidly diminishing of intensity pain, anxiety and depressive symptoms among post-cardiac surgeries patients who undergo the evidence exercises with early mobilization intervention.

6. Recommendations

- Further studies warranted through a multidisciplinary perspective to identify all barriers against patient mobility and translate the evidence to practice for final global improvements in patient outcomes.
- Ascertain the potential patient's safety through accurate and ongoing assessment of hemodynamic monitoring and oxygenation stability before, during and after any exercise and mobility intervention.

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