Effect of Nursing Procedures Related Pain on Post Open Heart Surgery Patients' Clinical Outcomes

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Abstract

Background: Open heart surgery is one of the most important surgical interventions that can resolve many cardiac problems. **Aim:** is to assess the effect of nursing procedures related pain on post open heart surgery patient's clinical outcomes. **Design:** This descriptive correlational study **Setting:** This study was conducted in the Cardiothoracic Intensive Care Unit at Tanta International Teaching Hospital at Tanta city, Gharbia governorate. **Subjects**: 60 post open heart surgery patients aged from 21 to 60 years old of both sex. **Tools:** Three tools were used in this study **Tool I:- A Structured Interview Schedule for Open Heart Surgery;** it included the following parts:- **Part (A)** Patient's Socio demographic Characteristics and **Part (B):** Patient' Clinical Data, **tool II: Nursing Procedures related pain Assessment Sheet, tool (III): Post Open Heart Surgery Patient's Clinical Outcomes**: **Part (A):** Critical-care Pain Observation Tool (CPOT), **Part (B):** Hemodynamics Parameters Assessment Sheet, and **Part (C):** Face Anxiety Scale (FAS). **Results:** There were statistically significant differences regarding all items of CPOT, and FAS for suction, deep breathing and coughing, and positioning procedure, while p= 0.000. There were statistically significance differences regarding all hemodynamic parameters with p= 0.000. For positioning procedure, there were statistically significance differences regarding systolic, diastolic blood pressure and mean arterial pressure while $p< 0.05$. Statistical significance difference was observed throughout three periods of the study with $p < 0.05$. In relation to gender, Statistical significance difference was observed during suctioning procedure regarding CPOT with (p= 0.032).**Conclusions:** CPOT tool is a sensitive due to having multiple items and evaluating different behavioral indicators for pain in intubated patients Moreover, CPOT is more consistent with physiologic changes due to pain in patients. **Recommendation:** Routine pre and postoperative assessment of patients who are undergoing open heart surgeries.

Keywords: Intensive Care Unit, Mean Arterial Pressure, **Open Heart Surgery, Pain, Suction**

Introduction

Open heart surgery is one of the most important surgical intervention that can resolve many cardiac problems, the most important of which are myocardial revascularization, valve repair or replacement, repair of congenital or acquired structural abnormalities, placement of a mechanical assist device, and heart transplantation. Coronary Artery Bypass Grafting (CABG) and heart valve surgery are the most commonly performed procedures in cardiac surgery worldwide. [1,2] The post-operative phase is the most critical period for open heart surgery patients, it is characterized by many complications as pulmonary, cardiovascular, neurological and renal disorders, that prolong hospitalization, increase costs and have a direct effect on survival probability.[3]

According to statistics from open heart surgery department at Tanta University, patients admitted for open heart surgery are about 20 cases per month. Also, it was reported that about 53% of patients had undergoing CABG with cardiopulmonary Bypass**.** [4] The incidence of postoperative cardiovascular complications was 28.1% (dysrhythmia 9.9%, sudden stroke 3.3%, bleeding 3.3%, thrombus 11.7%). Other complications included pulmonary (4.5%), infections (4.6%) and renal impairment (7.6%) [5].

Patients in Intensive Care Units (ICUs) experience pain due to multiple causes such as their underlying health condition, catheters or tubes inserted into them, and because they are immobile. They also experience pain as a result of the care-related procedures performed for them [6]. Care-related pain is a broad concept that includes pain during medical examination, nursing care, transportation within hospital and even the waiting period during diagnostic imaging interventions. Despite the frequency of these procedures in ICUs, little is known about the level of pain associated with them [7].

Previous studies have shown that most patients rated their care-related pain as severe or extremely severe. In particular, repositioning is reported to be the most painful procedure. Factors that could increase the risk of higher levels of pain during these procedures include, patient's age, the type of procedure being undertaken, receiving analgesic medication one hour before the procedure, and pain levels prior to these procedures[8,9].

The daily nursing procedures and interventions can be a considerable source of pain for open heart surgery patients. The fact that more than 30% of ICU patients regardless of diagnosis experience pain at rest and that this percentage exceeds 50% during common care procedures, underscores the need for high-quality pain management. Some of the most painful procedures experienced by cardiothoracic patients are nursing care procedures such as turning, physical therapy, catheterizations, transporting patients, endotracheal intubation, suctioning, tube and drain removal, wound care and arterial line insertion [10, 8].

Pain is still a common problem among intensive care patients, especially in the open-heart surgical ICUs and its severity may increase during invasive and painful daily nursing procedures. [11]

The aim of the Study was to: Assess the effect of nursing procedures related pain

on patients' clinical outcomes Post open heart surgery.

Research question: What is the effect of nursing procedures related Pain on Patients' clinical outcomes Post open heart surgery?

Subjects and Methods:

Study design: - A descriptive correlational research design was utilized in this study.

Study Setting:

This study was conducted in Cardiothoracic Intensive Care Unit at Tanta International Teaching Hospital which is affiliated to Tanta University Hospital.

Study Subjects:

A purposive sampling of 60 adult patients post open heart surgery that has been admitted to Cardio Thoracic Intensive Care Unit and meeting the inclusion criteria. The sample size calculation by power analysis based on patient's admission in the hospital per year (220 patients/2020).

Study tools:

Three tools were used in this study:

Tool (I): A Structured Interview Schedule of Open Heart Surgery

- It was developed by the researcher and it included the following parts:

Part (A) Patient's Socio demographic Characteristics:

It was included data about patient's age, sex, patient's code, marital status, educational level.

Part (B) Patient' Clinical Data:

It was included data about patient's current diagnosis, type of operation, past, present medical and surgical history and patient' parameters (Pao_2, $Paco_2$, Fio_2 and PEEP).

Tool (II): Nursing Procedures related pain Assessment Sheet

This tool was developed by the researcher after reviewing recent literature [12, 13, 14]. It is a self-reported tool used by all patients to describe pain level for each procedure by using numerical rating scale. [15]

This tool was used to assess pain associated with nursing procedures that open-heart surgery patients undergo during ICU stay.

Pain was assessed during the following nursing procedures: Positioning, suctioning, deep breathing and coughing exercises. Patients are asked to circle the number between 0 and 10 and each procedure was categorized as: painless procedure was scored as (0), mild painful procedure was scored as (1-3), moderate painful procedure was scored (4-6) and most painful procedure was scored as (7-10).

Tool (III): Post Open Heart Surgery Patient's Clinical Outcomes:

Part (A): Critical-Care Pain Observation Tool (CPOT): [16] .

The Critical-Care Pain Observation Tool (CPOT) is one of the most valid and reliable behavioral pain scales used in non-verbal ICU patients. It was developed by **Gelinas C et al (2014).** The CPOT includes four behavioral domains: a) facial expression; b) body movements; c) compliance with ventilator (for mechanically ventilated patients) or vocalization (non-ventilated patients); and d) muscle tension.

Scoring system:

Each component was scored from (0 to 2) for a possible total score ranging from (0 – 8). Zero indicates no pain and eight indicates severe pain.

Part (B): Hemodynamics Parameters Assessment Sheet [17].

This part was developed by the researcher after reviewing related literature and used to assess heart rate, respiratory rate, blood pressure, oxygen saturation, mean arterial pressure (MAP). It was used pre, during and 10 minutes after performing each nursing procedure.

Part (C): Face Anxiety Scale (FAS)

This scale was developed by **McKinley et al. (2003)** [18] to measure anxiety level in open heart surgery patient. The FAS is a single-item scale, with six possible responses represented by pictures of faces ranging from the face with neutral facial expression to a face showing extreme anxiety and fear.

Scoring system: The scale ranged from (0-5). Zero indicates no anxiety and five indicate highest anxiety.

Anxiety Level	None	Mild	Mild-Moderate	Moderate	Moderate-High	Highest
Faces						

Method

The study was accomplished through the following steps:

Administrative process:

An Official hospital Permission and written approval to carry out the study was obtained from the Dean of Faculty of Nursing to the manager of Cardio Thoracic Intensive Care Unit of Educational Tanta University Hospital before conducting this study through official letters explaining the purpose of the study.

Ethical Consideration:

1. Informed and written consent was obtained from every patient after explanation of the aim of the study and assuring them confidentiality of collected data.
2. Approval of ethical committee was obtained from faculty of nursing and faculty of medicine at Tanta University.
3. Confidentiality and privacy of the studied patients was maintained by using code number instead of the patient's name.
4. Patients were informed that participation is voluntary and that they could withdraw from the study at any time.

Tool development:

5. Tools I, II and Tool III part B were developed by the researcher after extensive review of the related literature.

Validity of the Tools

6. All tools were tested for content validity by seven experts in the field of Critical Care Nursing at the Faculty of Nursing in Tanta University, and Biostatistics and modifications was done before conducting the study.

Pilot study:

7. It was conducted before the actual study on 10% of the patients (6 patients), in order to test the clarity, feasibility and applicability of the different items of the developed tools. Modification, rephrasing and some additional terms were done by the researcher before the main study, according to the experience gained from this pilot study. Data obtained from those patients were excluded and not included in the current study.

Reliability of the tools

- Reliability of the tools was tested to determine the extent to which the questionnaire items are related to each other by using cronbach alpha test.
- The reliability of adopted tools (tool III part a, c) was done by the original author and the reliability of developed tools (tool

I, II and III part b) was done by the researcher.

- Cronbach's Alpha for tool I is 0.781 for 12 items applied on 6 patients.
- Cronbach's Alpha for tool II is 0.906 for 10 items applied on 6 patients.
- Cronbach's Alpha for the sheet in total is 0.878 for 27 items applied on 6 patients.
- Reliability of tool III part A was (0,08 to 0,93), part C was ($r = 0.89$; $p < 0.001$)

Data collection

- Data were collected from patient's sample who met the study criteria.
- Data were collected over a period of 6 months, started from august 2022 to January 2023.
- The data was collected immediately postoperative based on the modifications that were made after pilot study and comments of juries.
- The patients were interviewed individually using the previously mentioned data collection tools.
- The purpose of the study was explained by the researcher to each patient included in this study.

The present study was conducted through two phases which include assessment and evaluation phase;

Assessment phase:

- This phase was conducted with obtaining an official permission to conduct the study. The tools of the study were prepared after reviewing the recent literature.

8. The researcher used tool (1) a structured interview schedule at the first time of patient admission for collection of patients' data and assessed the patient who met the inclusion criteria.

9. In tool (1) part (A&B), each patient was assessed regarding socio- demographic data (patient's age, sex, patient's code, marital status, and educational level), patient's clinical data (patient's current diagnosis, type of operation, past, present medical and surgical history and ventilator parameters (Pao2, Paco2, Fio2 and PEEP).

10. Pre procedural pain assessment;

11. Before initiating the selected procedure, the researcher assessed the Pain intensity among patients by using CPOT after observation for about one minute. The mean score of the CPOT that obtained by the researcher was finally recorded on the data collection sheet. If the patient's HR and BP were being monitored by either invasive or non-invasive electronic monitoring, the readings were recorded.

12. Procedural pain assessment;

13. During the procedure, the patient was observed for one minute and the CPOT was scored. Immediately after the procedure was completed, the patient's HR and BP (if monitored) at that time were recorded on the data collection sheet. Additional procedure-related information was obtained from the patient's medical record.

14. Also the researcher used tool (II) to assess pain associated with nursing procedures that open heart surgery patients was been undergo during ICU stay.

15. In this tool, the researcher interviewed with each patient individually for reporting each procedure as painless, mild painful, moderate painful and most painful procedure.

16. Pain was assessed during the following nursing procedures: Positioning, suctioning, deep breathing and coughing exercises by using CPOT in intubated ICU patients, It included four behavioral domains: a) facial expression; b) body movements; c) compliance with ventilator

(for mechanically ventilated patients) or vocalization (non-ventilated patients); and d) muscle tension.

- The researcher assessed heart rate, respiratory rate, blood pressure, oxygen saturation, MAP by using tool III Part (B). This part was used pre, during and after performing each nursing procedure, Part (C) FAS was been used to measure anxiety level in intubated patient in Intensive Care Unit.

17. The following nursing procedures related pain that was performed daily during patient's stay in Intensive Care Unit including:

- Positioning.
- Suctioning.
- Deep breathing and coughing exercises.

- Turning, moving and sample drawing were excluded from the study based on the modifications of pilot study and recommendations of juries.
- In this part the researcher assessed the level of anxiety for each patient by using the anxiety scale and reported the level of anxiety throughout three periods of the study.

Evaluation phase:

- In this phase, the researcher observed each patient during each nursing procedure and after 10 minutes to measure pain severity by using Tool (III) part (A) critical care pain observational tool. Heart rate, respiratory rate, blood pressure, oxygen saturation, MAP also was evaluated by using Tool III part B.
- Level of anxiety was measured during and after 10 minutes after each procedure by using tool III part C.

Statistical analysis of data:

- The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 28. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison was done using Chi-square test ($\chi 2$). For comparison between means of two variables in a group, paired samples t-test was used. For comparison between means for variables during three period of intervention in a group, or for more than two variables, the F-value of analysis of variance (ANOVA) was calculated.
- Correlation between variables was evaluated using Pearson and Spearman's correlation coefficient r.
- A significance was adopted at $P<0.05$ for interpretation of results of tests of significance (*). Also, a highly significance was adopted at $P<0.01$ for interpretation of results of tests of significance (**). [19]

Results

Table; (1) shows distribution of the studied open-heart surgery patients regarding their socio-demographic characteristics.

In this table, near two third (60%) of studied patients were in age group of 50-60 years with mean ± SD (47.72±10.511) year. Regarding gender and marital status, more than half (53.33%) and the majority (80%) of the studied patient were male and married, respectively. Regarding educational level, more than one- third (38.33%) of the studied patients had highly education.

Table (2) presents the distribution of the studied open-heart surgery patients regarding their clinical data.

In relation to current diagnosis, it was observed that, more than two thirds (71.67%) of studied patients had myocardial infarction. Also, less than one third (28.33%) of them had rheumatic heart diseases. Regarding chief complains more than two thirds (73.33%) of the open-heart surgery patients had chest pain, while two fifth (40%), less than one third (31.67%) of the studied patients and the minority of patients (13.33%) had dyspnea, orthopnea and lethargy respectively.

Concerning past medical history, more than half (55%) of studied patients had history of diabetes mellitus. While less than half (43.33%) of them had history of hypertension and less than one third (20%) had history of cardiac disease.

Figure (1): Presents Mean scores of the patients' parameters of the studied open-heart surgery patients.

In this figure, it was observed that, the mean score of PaO_2 for the studied open-heart surgery patient was (99.2 ± 11.821), paco2 was (40.02 ± 4.341), Fio2 was (98.48±4.044) and PEEP was (6.18±0.792) for the studied open-heart surgery patients.

Table (3) shows Mean scores of hemodynamic parameters of the studied open-heart surgery patients for suction procedure.

In this table, the mean score of heart rate for patient undergoing open heart surgery was 90.60±6.181 before suctioning, and increased to 106.12±8.427 during suctioning then became 92.65±5.917 after 10 minutes. In relation to respiratory rate, mean score was 19.35±4.058 before procedure and increased to 28.57±3.907 during suctioning procedure, then became 20.05±4.339 after procedure.

Regarding oxygen saturation, the mean score were 97.05±2.054, 93.15±2.298 and 96.87±1.620 before, during and after procedure respectively. There were statistically significance difference regarding all hemodynamic parameters with P= 0.000

Also, the mean score of heart rate for patients was (90.60±6.181) before positioning procedure, and it was increased to (91.80±6.265) during procedure then became (92.65±5.917) after positioning procedure. In relation to respiratory rate, mean score was (19.35±4.058) before procedure and increased to (20.22±3.765) during procedure, then became (20.05±4.339) after procedure.

Regarding oxygen saturation, the mean scores were (97.05±2.054), (96.67±2.355) and (96.87±1.620) before, during and after positioning procedure respectively. In addition, the mean score of heart rate for patient undergoing open heart surgery was 90.60±6.181 before deep breathing and coughing procedure, and it increased to 98.58±6.220 during procedure then became 92.65±5.917 after procedure. In relation to respiratory rate, mean scores were 19.35±4.058, 24.47±2.971 and 20.05±4.339 before, during and after deep breathing and coughing exercises procedure respectively. There were statistically significance differences regarding all hemodynamic parameters with p= 0.000

Table (4): shows association between socio-demographic characteristics of the studied open-heart surgery patients on their critical-care pain (CPOT) score

throughout periods of suctioning procedure.

In this table, it was observed that, the mean score of CPOT before suctioning procedure was (2.29±1.11) among age group of (21-<30), while it was (6.57±1.51) during the procedure and become (1.86±1.22) after the procedure in the same age group. Also, statistical significance difference were observed throughout three periods of the study with $p < 0.05$

In relation to gender, statistical significance difference was observed during suctioning procedure regarding CPOT with (p= 0.032)

In relation to marital status, current diagnosis, there no statistically significant difference were observed throughout the procedure with (P>0.05).

Table (5): shows relation between socio-demographic characteristics of the studied open-heart surgery patients and their Face Anxiety (FAS) score throughout periods of suctioning procedure.

In this table, it was observed that, there was no statistically significant effect of socio-demographic characteristics of the studied open-heart surgery patients on their Face Anxiety (FAS) score throughout periods of suctioning procedure as age, gender, marital status and current diagnosis at (P>0.05).

Figure (2): Shows Distribution of the studied open-heart surgery patients according to severity of procedure.

In this figure, it was observed that, near to half (48.33%) of sample reported moderate pain during positioning procedure, while half (50.00%) of them reported severe pain during suctioning procedure, in addition, less than half (45.00%) of sample reported moderate pain during deep breathing and coughing procedure.

Table (1): Distribution of the studied open-heart surgery patients regarding their socio-demographic characteristics.

Characteristics	The studied open-heart surgery patients (n=60)	
	N	%
Age (in years)		
- (21-<30)	7	11.67
- (30-<40)	4	6.67
- (40-<50)	13	21.67
- (50-60)	36	60.00
Range	**(21-60)**	
Mean ± SD	**47.72±10.511**	
Gender		
- Male	32	53.33
- Female	28	46.67
Marital status		
- Single	5	8.33
- Married	51	85.00
- Widow	4	6.67
Education level		
- Read and write	13	21.67
- Primary education	11	18.33
- Secondary education	13	21.67
- Highly education	23	38.33

Table (2): Distribution of the studied open-heart surgery patients regarding their clinical data.

Clinical data	The studied open-heart surgery patients (n=60)	
	N	%
Current diagnosis		
- Myocardial infarction	43	71.67
- Rheumatic heart diseases	17	28.33
# Chief complains		
- Fever	13	21.67
- Chest pain	44	73.33
- Productive cough	10	16.67
- Dyspnea	24	40.00
- Orthopnea	19	31.67
- Leathery	8	13.33
# Past medical history		
- Hypertension	26	43.33
- Diabetic mellitus	33	55.00
- Atherosclerosis	2	3.33
- Kidney disease	2	3.33
- Cardiac disease	15	25.00
- Endocrine disease	1	1.67
Past surgical history		
- Yes	57	95
- No	3	5

More than one answer was chosen

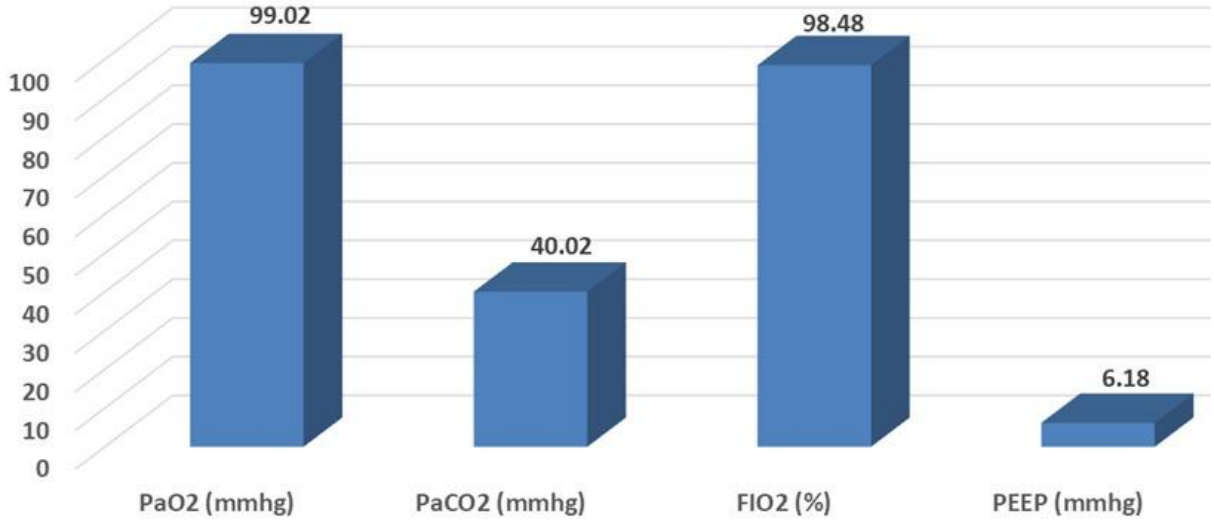

Figure (1): Mean scores of the patients' parameters of the studied open-heart surgery patients.

Table (3): Mean scores of hemodynamic parameters of the studied open-heart surgery patients for pain related procedures.

Hemodynamic Parameters		The studied surgery patients (n=60) Range Mean ± SD			F P
		Before Procedure	During Procedure	After 10 minutes 0f Procedure	
Heart Rate (60-100 b/min)	**Suction**	(77-105) 90.60±6.181	(81-123) 106.12±8.427	(81-105) 92.65±5.917	**88.68 0.000***
	Positioning	(77-105) 90.60±6.181	(80-105) 91.80±6.265	(81-105) 92.65±5.917	0.587 0.557
	Coughing breathing	(77-105) 90.60±6.181	(80-110) 98.58±6.220	(81-105) 92.65±5.917	**27.649 0.000***
Respiratory rate (16-20 c/min)	**Suction**	(12-32) 19.35±4.058	(22-37) 28.57±3.907	(12-29) 20.05±4.339	**93.76 0.000***
	Positioning	(12-32) 19.35±4.058	(13-32) 20.22±3.765	(12-29) 20.05±4.339	0.942 0.392
	Coughingand breathing	(12-32) 19.35±4.058	(19-30) 24.47±2.971	(12-29) 20.05±4.339	**31.395 0.000***
Blood pressure Systolic	**Suction**	(90-120) 110.67±8.206	(90-170) 129.00±16.642	(90-130) 116.67±9.328	**36.46 0.000***
	Positioning	(90-120) 110.67±8.206	(90-150) 118.33±11.813	(90-130) 116.67±9.328	**9.229 0.000***
	Coughing breathing	(90-120) 110.67±8.206	(90-160) 125.50±13.583	(90-130) 116.67±9.328	**29.917 0.000***
Diastolic	**Suction**	(60-80) 70.00±8.437	(60-100) 80.67±11.770	(60-90) 76.67±9.328	**17.65 0.000***
	Positioning	(60-80) 70.00±8.437	(60-100) 75.50±10.156	(60-90) 76.67±9.328	**5.619 0.004***
	Coughing breathing	(60-80) 70.00±8.437	(60-90) 79.67±10.410	(60-90) 76.67±9.328	**16.578 0.000***

Oxygen saturation (>95%)	**Suction**	(93-100) 97.05±2.054	(90-99) 93.15±2.298	(94-100) 96.87±1.620	**16.35** **0.000***
	Positioning	(93-100) 97.05±2.054	(90-100) 96.67±2.355	(94-100) 96.87±1.620	0.455 0.635
	Coughing Breathing	(93-100) 97.05±2.054	(90-99) 95.30±2.280	(94-100) 96.87±1.620	**13.805** **0.000***
MAP (70-100 mmHg)	**Suction**	(70-95) 83.23±8.259	(70-123) 96.58±11.920	(70-103) 89.73±9.012	**27.58** **0.000***
	Positioning	(70-95) 83.23±8.259	(70-117) 89.53±10.053	(70-103) 89.73±9.012	**7.549** **0.001***
	Coughing breathing	(70-95) 83.23±8.259	(70-110) 94.72±9.800	(70-103) 89.73±9.012	**24.543** **0.000***

* Significant at level P<0.05.

Table (4): socio-demographic characteristics of the studied open-heart surgery patients on their critical-care pain (CPOT) score throughout periods of suctioning procedure.

Characteristics	**The studied open-heart surgery patients (n=60) CPOT score Mean ± SD**		
	Before procedure	**During Procedure**	**After Procedure**
Age (in years)			
- (21-<30)	**2.29±1.11**	**6.57±1.51**	**1.86±1.22**
- (30-<40)	0.50±1.00	6.25±1.26	0.75±0.96
- (40-<50)	0.62±1.04	6.23±1.24	0.62±0.65
- (50-60)	0.33±0.54	5.42±0.94	0.72±0.88
F, P	**12.495, 0.000***	**3.500, 0.021***	**3.583, 0.019***
Gender			
- Male	1.08±1.46	6.98±1.11	0.75±0.92
- Female	**0.82±1.06**	**5.82±1.25**	**0.93±0.98**
t, P	1.992, 0.163	4.822, 0.032	0.533, 0.468
Marital status			
- Single	**1.60±0.55**	**5.80±1.10**	**1.00±1.00**
- Married	0.41±0.78	5.63±1.08	0.71±0.88
- Widow	1.00±0.82	6.50±1.73	1.00±0.82
F, P	**3.010, 0.146***	**2.103, 0.152***	**1.951, 0.159***
Current diagnosis			
- Myocardial infarction	0.47±0.74	5.63±1.05	0.72±0.85
- Rheumatic heart diseases	**1.06±1.35**	**6.18±1.38**	**1.12±1.11**
t, P	**2.133, 0.152***	2.779, 0.101	2.206, 0.143

Table (5): Effect of socio-demographic characteristics of the studied open-heart surgery patients on their Face Anxiety (FAS) score throughout periods of suctioning procedure.

Characteristics	The studied open-heart surgery patients (n=60) Face Anxiety (FAS) score Mean ± SD		
	Before Procedure	During Procedure	After Procedure
Age (in years)			
- (21-<30)	1.01±0.72	3.14±0.90	**1.29±1.11**
- (30-<40)	1.00±0.82	3.25±0.96	0.50±0.58
- (40-<50)	**1.46±0.97**	3.77±0.44	1.23±0.83
- (50-60)	1.17±0.78	**3.47±0.61**	1.17±0.61
F, P	0.669, 0.575	1.710, 0.175	1.201, 0.318
Gender			
- Male	1.03±0.82	3.41±0.62	1.09±0.78
- Female	**1.39±0.79**	**3.57±0.69**	**1.21±0.69**
t, P	3.008, 0.088	0.962, 0.331	0.400, 0.529
Marital status			
- Single	1.00±0.71	3.00±1.00	**1.40±1.14**
- Married	1.20±0.85	**3.53±0.61**	1.14±0.72
- Widow	**1.50±0.58**	3.50±0.58	1.00±0.00
F, P	0.409, 0.666	1.536, 0.224	0.375, 0.689
Current diagnosis			
- Myocardial infarction	1.19±0.79	**3.56±0.59**	1.14±0.64
- Rheumatic heart diseases	**1.24±0.90**	3.29±0.77	**1.18±0.95**
t, P	0.043, 0.836	2.041, 0.158	0.030, 0.862

* Significant at level P<0.05.

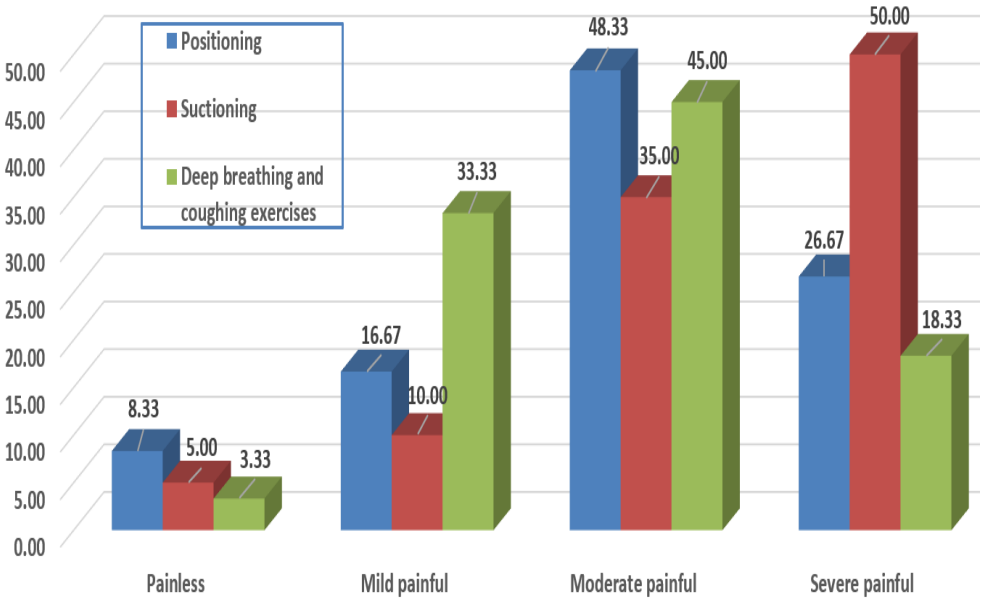

Figure (4-2): Distribution of the studied open-heart surgery patients according to severity of procedure.

Discussion

Open heart surgery is a surgery in which the chest is opened, and is done on the heart muscle, valves, arteries, or other parts of the heart. It is a major surgery that requires hospital stay for a week or more. Open heart surgery patients will be admitted to the Intensive Care Unit immediately after surgery [(20)]. Although these surgical outcomes are beneficial, research has suggested that the experience and recovery process after open-heart surgery may be more complex than anticipated and presents psychosocial and physical challenges that will continue after hospital discharge [(21)].

Discussion of the present study will focus on the findings related to socio-demographic characteristics of the studied patients, assessment of clinical data, and the assessment of current and previous status of the studied patients, patient's, and hemodynamic parameters, and the effect of socio-demographic characteristics of the studied open-heart surgery patients on their Face Anxiety (FAS) scale and CPOT.

Regarding age, the present study revealed that near two third of studied patients were in age group of 50-60 years old. This may be due to increased life stressors even among people with this group of age.

This result is in accordance with, **Karabulut et al., (2015)[(22)]** in study entitled "Patient satisfaction with their pain management and comfort level after open heart surgery**"** who indicated that patient's age ranged from 25 to 77 years old, with an average age of 58.4 years. Also, a study conducted by **Ahmed et al,(2017)[(23)]** revealed that the average age of the studied sample ranged between 50 and 59 years with a mean age of (45.9±11.7)

However, **Abd El-gafour et al,** (**2021**) [(24)] in a study about "**assessment of patients' needs pre and post open heart surgery**" revealed that less than half of the studied patients ranged between 50-60 years. Moreover, **Leahy et al, (2015)[(25)]** revealed

that average age of the studied sample was 40 (range 20-55)

In relation to gender, the present study found that more than half of patients were males. This may be due to unhealthy lifestyle and genetic factors that proposed that estrogen hormone protect women from cardiac diseases. Furthermore, male individuals are at risk of open-heart surgery due to the nature of the work difficulties of their daily living.

This result is confirmed by, **Dibardino et al., (2012) [26]** who stated that more than half of the sample were male. Additionally, **(Hamdan et al., 2022)[27]** revealed that the majority of his study sample was men.

On the other hand, **Dixon et al., (2022) [28]; Alamri et al., (2023)[29]** assessed coronary artery bypass grafting (CABG) postoperative outcomes and associated factors in male and female patients. The results showed that females are major contributors and have an increased risk of short-term mortality after cardiac surgery compared to males.

Regarding marital status, the results of the current study indicated that the majority of the studied patients were married. This may be due to social and psychological stress of Egyptian societies. This study is supported by **(Fredericks and Sidani, 2012) [30] and (Karabulut et al. 2015) [22]** who highlighted that most of studied patients were married.

Concerning educational level, the findings revealed that more than one- third of the studied patients had high educational level. This may be due to good treatment adherence and early seeking of medical help. This finding is supported by **Karabulut et al.,(2015)[22]** who highlighted that about half of the studied group was literate. Additionally, **Mosleh et al, (2017) [31]** found that about one half of sample had secondary education**.** On the other hand, the study is contradicted with **Ahmed et al. (2017) [23]** And **Abdel-Ghany et al. (2016) [32]** they reported in their study that majority of the study sample were illiterate.

Regarding current diagnosis, it was observed that, more than two thirds of studied patients had myocardial infarction; also, less than one third of them had rheumatic heart diseases. This indicate to most causes of open heart surgery is diseases that related to coronary artery diseases

Regarding Chief complains, more than two thirds of the open-heart surgery patients had chest pain, while two fifth, less than one third of the studied patients and the minority of patients had dyspnea, orthopnea, and lethargy. From the researchers' point of view this complains are related to the diagnosis.

All studies patients underwent elective cardiac surgery including coronary artery bypass graft, valve replacement and valve repair **Braun et al., (2012) [33] Najafi et al., 2014) [34]**Moreover,**Ribeiro et al.,(2015) [35]** reported that most near to one quarter of patient had a diagnosed with acute myocardial infarction before open heart surgery, in addition, another Percentage in the same study equal to one quarter have a coronary artery disease.

However, **(Alamri et al., 2023)[29]** stated that the majority of them had rheumatic heart diseases.

Concerning past medical history, more than half of studied patients had history of diabetes mellitus. While less than half of

them had history of hypertension and less than one third had history of cardiac disease. Also, less than half of studied patients had history of general surgery and less than one third of them had history of other surgery as caesarean section.

This may be due to behaviors such as tobacco use, an unhealthy diet, harmful use of alcohol, and inadequate physical activity, as well as physiological factors such as high blood pressure, high blood cholesterol, and high blood sugar or glucose. Also, presence of old and married female is considered a reason for presence of previous cesarean injury even in a low percentage.

In line with the present study, **Kiavar et al., (2016) [(36)]** observed that neat to quarter of the studied sample had diabetes mellitus and less than one third of them had hypertension. Additionally, **Abd-Elmalek et al., (2019) [(37)]** revealed that the majority of patients in both groups had no past history, and about half of the conventional had rheumatic heart. Similarly, with the present findings, **Lancellotti et al, (2017) [(38)]** reported that, most of subjects complain of CHD and minority had valvular heart disease. Moreover, a study conducted by **Bassand et al, (2018) [(39)]** found that, about two thirds of patients had hypertension and **(Ayasrah, 2016) [(40)]** found that more than two thirds of them had previous medical history. On average, more than one third were diagnosed with both comorbidities of diabetes mellitus and hypertension, and near to one quarter of them had cardiac problems. Also, **Abd El-gafour et al. (2021) [(24)]** observed that, all studied patients had history of heart disease, and, two-thirds of them had history of hypertension. Finally, **Karabulut et al. (2015) [(22)]** observed that majority had chronic disease and the majority of subjects underwent coronary artery bypass grafting.

Concerning patients' parameters of the studied open-heart surgery patients, the current study reported a normal range of pao2, paco2, Fio2 and PEEP. This is may be interpreted that the patient's condition was stable after surgery. The current funding was supported by **(Hassan et al., 2018) [(41)]** who reported baseline of PaO_2 for 66 patients after open heart surgery. In line with the current results, **(Khalil et al., 2019) [(42)]** showed that mean score of PaO_2, paco2, Fio2 and PEEP were within the normal range for the studied open-heart surgery patients.

Regarding procedural pain during suctioning procedure:

Concerning hemodynamic parameters throughout suctioning procedure, in the current study, the results shows changes in the mean scores of all parameters as heart rate, respiratory rate, systolic and diastolic blood pressure, oxygen saturation and the mean arterial pressure, compared with their values before and after the procedure. From the researchers, point of view, the changes may be due to the nature of the procedure as suctioning considered the most painful procedures that may affect hemodynamic parameters. Change in mean score of heart rate was observed during procedure compared with its value before and after the suctioning procedure.

In the agreement with the results of the current study, **Ayasrah, (2016) [(40)] and Ebrahimian et al., (2020) [(43)]** highlighted that the mean score of heart rate, respiratory rate, systolic and diastolic blood pressure for patient undergoing open

heart surgery increased during suctioning procedure than before the procedure then increased again after the procedure. On the other hand, O2 saturation before the procedure was 97.77±2.09 and decreased to 94.80±3.48 during the procedure, then increased to after the procedure was 92.93±4.58 .this may be due to the effect of catheter insertion in the airway. **Regarding hemodynamic parameters for deep breathing and coughing procedure,** in the current study, the results shows changes in the mean scores of all parameters as heart rate, respiratory rate, systolic and diastolic blood pressure, oxygen saturation and the mean arterial pressure, compared with their values before and after the procedure. From the researchers, point of view, the changes may be due to the nature of the procedure as deep breathing and coughing procedure considered from the painful procedures that may affect hemodynamic parameters. Change in mean score of heart rate was observed during procedure compared with its value before and after deep breathing and coughing procedure.

In Contradict to the present study a study was found that examined the impact of early and regular mobilization on vital signs and oxygen saturation in patients undergoing open-heart surgery. The study did not report any significant differences between heart rate, respiratory rate, mean arterial pressure, and oxygen saturation values obtained **Köse and Avşar (2021)**.[(44)] A study examined the effect of breathing exercises on hemodynamic parameters in hypertensive patients. The study found that deep breathing exercises at a respiratory rate of 6 or 10 breaths per minute significantly reduced systolic and diastolic blood pressure in hypertensive patients **(Urell et al., 2012)**. [(45)] Regarding respiratory rate, a study found that breathing exercises were effective in increasing oxygen saturation, and pulmonary function tests in patients with chronic obstructive pulmonary disease **Renault et al(2009)**. [(46)]

A study examined the effect of deep breathing and coughing exercises on hemodynamic parameters before and after the exercise found that there were statistically significant differences in all hemodynamic parameters before and after deep breathing and coughing exercises **Bourbonnais et al(2016)**.[(47)] Another study examined the effect of postural drainage and deep breathing-coughing exercises on oxygen saturation, and pulmonary function tests in patients with chronic obstructive pulmonary disease **(Arık and Çevik, 2021).**[(48)] Regarding blood pressure, a study entitled (What blood pressure is appropriate for cardiopulmonary bypass and how to get it), Found that mean arterial pressure was maintained between 50 and 60 mmHg during cardiopulmonary bypass in one group and between 80 and 100 mmHg in the other group**(Merry, 2006)**. [(49)] On the other hand, **Tate(2012**) [(50)] did not report any significant differences between respiratory rate, mean arterial pressure, and oxygen saturation values obtained.

In line with our results, the study found that during the recovery phase, all variables returned to baseline values **Bilo et al., (2012).**[(51)]

Regarding hemodynamic parameters for positioning procedure:

The mean score of oxygen saturation was decreased during positioning procedure

and it was improved after procedure. There were statistically significance differences regarding systolic, diastolic blood pressure and mean arterial pressure, on the other hand no significance differences were observed in relation to heart rate and respiratory rate throughout periods of study.

The positioning procedure may trigger an increase in sympathetic activity. This can lead to increased heart rate, vasoconstriction, and increased blood pressure. The positioning procedure may also trigger an increase in vagal activity. This can lead to decreased heart rate and vasodilation, which can decrease blood pressure.

In line with the current results, **Köse and Avşar (2021)** [(44)] found that there were significant changes observed in pulse rate, systolic blood pressure, respiratory rate, body temperature, and oxygen saturation levels when the vital signs and oxygen saturation levels of the patients obtained before and after the mobilization session where the mean pulse values were decreased after the mobilization session. It was found that the systolic blood pressure decreased after the mobilization.

However, a study found that there were no significant pulse rate, systolic blood pressure, respiratory rate, body temperature, and oxygen saturation levels when the vital signs and oxygen saturation levels of the patients obtained before and after the third mobilization session **Ozcelik et al., (2017)**[(52).]

Regarding socio demographic characteristics on face anxiety scale throughout suctioning procedure, it was found that there was no statistically significant effect of socio-demographic characteristics of the studied open-heart surgery patients on their Face Anxiety (FAS) score as age, gender, marital status, and current diagnosis.

The patients may have been relatively homogeneous in terms of their socio-demographic characteristics. Most of the patients may have been male, middle-aged, and married. This would make it difficult to detect a significant effect of socio-demographic characteristics on FAS score. The suctioning procedure may have been performed in a standardized manner, regardless of the patient's socio-demographic characteristics.

Suctioning procedure may be a stressful experience for all open-heart surgery patients, regardless of their socio-demographic characteristics. While there is no specific study that examined the effect of socio-demographic characteristics on FAS during suctioning procedures, some studies suggest that preoperative anxiety is high in cardiac surgery patients and is influenced by factors such as fear of the unknown and lack of information.

Also, other studies found no significant association between gender and endotracheal suctioning in critical care patients. **Liu et al., (2015)**[(53)] **,Modanloo et al., (2019)**[(54)]**, Alkubati et al., (2022)** [(55).]Therefore, the relationship between gender and pain or anxiety during suctioning procedures may vary depending on the study and population being examined.

In line with the results, **Zaini et al., (2022)** [(56)] found that there were no major differences in the anxiety level by gender, race, comorbid conditions, and level of pain among patients undergoing coronary artery bypass graft surgery.

However, **(Hernández-Palazón et al., 2018)** [57] found that there was a statistically significant difference in the anxiety level and socio demographic characteristics. Especially for those who had no previous anesthetic experience, and who were hospitalized before surgery, had higher anxiety scores.

Regarding socio demographic characteristics on CPOT throughout suctioning procedure.

Male and female patients may have different physiological responses to stress, which could lead to different CPOT responses to the suctioning procedure. Female patients may experience more anxiety and fear than male patients during the suctioning procedure, which could lead to a higher CPOT response. It is possible that female patients are simply more sensitive to the physiological and psychological effects of the suctioning procedure, which is reflected in their higher CPOT response. Hence, more research is needed to better understand the reasons for the difference in CPOT response to the suctioning procedure between male and female open-heart surgery patients.

In line with the results, **Maatouk et al., (2019)** [58]**, Yılmaz, (2020)** [59]**, Zaini et al., (2022)** [56] found that there was a statistically significant difference in CPOT scores between male and female patients during suctioning procedures.

Conclusion: -

Critically ill patients experience pain and anxiety prior and during routine nursing procedures.

Based on the finding of the present study, it can be concluded that, more than one third of sample reported severe pain during positioning procedure, compared to more than half of them during suctioning procedure and, less than one quarter of the studied patients reported severe pain during deep breathing and coughing exercises.

Recommendations:

Based on the finding of the current study, it can be recommended that:

- Routine pre and postoperative assessment of patients who are undergoing open heart surgery is recommended to identify the different patient's bio-psychosocial needs and consequently any risk factor and reduced the post-operative complications.
- The pre- and post-operative patients' education should be incorporated into routine nursing practice to reduce anxiety and improve the patient's post-operative outcome.
- Based on the current study finding it was recommended that further researches are needed to be replicated at various time points and on larger sample to understand the nature of relationships between studied variables and their relationship with recovery after open heart surgery.
- Routine assessment of nursing procedures that provoke pain and anxiety is recommended and related nursing interventions should be directed for patient before starting to reduce the severity of the painful procedures.
- Pain and anxiety should be treated before performing the painful procedures.
- Performing systematic initial and ongoing assessment of pain, administering analgesia and considering factors that exacerbate pain are crucial steps in improving patients' outcomes in ICU.

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