Arab American University
Faculty of Graduate Studies
Department of Health Sciences
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The Effect of Slow Deep Breathing Relaxation Exercise on Pain and Anxiety Levels during and Post Chest Tube Removal after Coronary Artery Bypass Graft Surgery in Nablus Hospitals

Ahmad Lutfi Abu Sabiha
202211976

Supervision Committee:
Dr. Basma Salameh
Dr.Ahmad Ayed
Dr. Jamal Qaddumi

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This thesis was defended successfully on 28 / 1 / 2025 and approved by:

Thesis Committee Members:

	Name	Title	Signature
1.	Dr. Basma Salameh	Main Supervisor	
2.	Dr. Ahmad Ayed	Members of Supervision Committee	Ahmad Ayed
3.	Dr. JamalQaddumi	Members of Supervision Committee	

Palestine, 1 / 2025

Declaration

I declare that, except where explicit reference is made to the contribution of others, this thesis is substantially my own work and has not been submitted for any other degree at the Arab American University or any other institution.

Student Name: Ahmad Lutfi Abu Sabiha

Student ID: 202211976

Signature: Ahmad Lutfi Abu Sabiha

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Dr. Ahmad Ayed
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Abstract

Background: Chest tube removal has been described by patients undergoing coronary artery bypass grafting procedures as a very stressful and unpleasant process. This emphasizes how important it is to put in place measures that successfully lessen discomfort both during and after chest tube removal. Researchers have looked into the effects of many non-pharmacological techniques. One method that nurses could use to help patients undergoing chest tube removal is slow deep breathing relaxation exercises.
Purpose: To evaluate the effect of slow deep breathing relaxation exercises on pain levels and anxiety levels during and post chest tube removal following coronary artery bypass grafting in Nablus hospitals
Methods: Experimental design was conducted to compare between scores of pain and anxiety levels during and post chest tube removal among the intervention and control groups.
A convenient sample had been selected from two hospitals in Nablus city (n=80). By randomization method the sample was divided into intervention group (n=40) and control group (n=40). slow deep breathing relaxation exercises was used for intervention group while standard care was used for the control. Data were collected through a questionnaire which composed of three parts. The first part gathered demographic and medical information. The second part assessed pain using the Numeric Pain Scale. The third part evaluated anxiety using the Visual Anxiety Scale. Data analysis was utilized to evaluate descriptive statistics, statistical inference, and correlations. The data were collected from the beginning of March to October 2024.
Results: There were significant differences in pain scores during chest tube removal between the intervention (M = 5.325, SD = 0.997) and the control (M = 7.125, SD = 0.939) (p = 0.000). Intervention group had a lower score of pain. There were significant differences in pain scores after chest tube removal between the intervention (M = 2.125, SD = 0.723) and the control (M = 3.575, SD = 0.903) (p = 0.000). Intervention group had a lower score of pain. There were significant differences in anxiety scores during chest tube removal between the intervention (M = 4.650, SD = 1.350) and the control (M = 6.100, SD = 1.008) (p = 0.000). Intervention group had a lower score of Anxiety. There were significant differences in anxiety scores after chest tube removal between the intervention (M = 1.400, SD = 1.105) and the control (M = 2.825, SD = 1.279) (p = 0.000). Intervention group had a lower score of Anxiety. The effects of slow deep breathing relaxation exercises on pain and anxiety levels did not significantly correlate with medical characteristics including BMI, smoking status, or the number of drains. The type of operation performed, and the degree of pain experienced during chest tube

removal had a significant relationship ($p = 0.000$), with more complex surgeries (such as coronary artery bypass grafting with multiple grafts) being linked to higher degrees of pain. Higher degrees of pain during removal ($p = 0.01$) and anxiety following removal ($p = 0.007$) were significantly associated with longer chest tube insertion times. Conclusion: The intervention group outperformed the control group, evidenced by significant differences in pain and anxiety scores. This study demonstrates the effectiveness of slow deep breathing relaxation exercises in reducing anxiety and pain during and after chest tube removal. The findings support the usefulness of relaxation techniques as a complement approach to postoperative care. Implementing targeted strategies taking that consider the type of operation and drain duration could improve patient outcomes.
Key Words: CABG, Pain, Anxiety, Nablus Hospitals

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List of Abbreviations of Definition

Abbreviation	Title
A-Fib	Atrial Fibrillation
AKI	Acute Kidney Injury
AVD	Aortic Valve Disease
BMI	Body Mass Index
CABG	Coronary Artery Bypass Graft Surgery
CAD	Coronary Artery Disease
CCU	Coronary Cardiac Unit
COP	Cut-off Points
CTR	Chest Tube Removal
CVD	Cardiovascular Diseases
DF	Degrees of Freedom
DM	Diabetes Mellitus
et al	And Others
HTN	Hypertension
IASP	International Association for the Study of Pain
ICU	Intensive Care Unit
IHD	Ischemic Heart Disease
M	Mean
MOH	Ministry of Health
MRD	Mitral Regurgitation Disease
MVD	Mitral Valve Disease
N	Frequency
NRS	Numeric Rating Scale

Abbreviation	Title
NSAIDs	Non-steroidal Anti-Inflammatory Drugs
p-Value	Probability Value
PCI	Percutaneous Coronary Intervention
PEEP	Positive End-Expiratory Pressure
PMH	Past Medical History
PSH	Past Surgical History
R	Correlation
RCT	Randomized Controlled Trial
SDBRE	Slow Deep Breathing Relaxation Exercise
SD	Standard Deviation
Sig.	Significance
SPSS	Statistical Package for the Social Sciences
TENS	Transcutaneous Electrical Nerve Stimulation
VAS	Visual Analog Scale

Chapter One: Introduction

1.1 Introduction

Coronary artery bypass graft surgery (CABG) involves utilizing either the patient's veins or arteries to create detours around narrowed sections of the coronary arteries. This surgical procedure aims to reestablish regular blood flow to the heart muscle (Alexander & Smith, 2016). With nearly 400,000 CABG surgeries conducted annually in the United States, it stands as the most frequently performed major surgical procedure (Alexander & Smith, 2016).

Cardiovascular diseases (CVD) are the leading cause of death in Palestine. According to the Palestinian Ministry of Health, CVD accounted for 31.2% of all deaths in 2012, rising to 31.9% in 2013. In 2013, there were 3,566 CVD-related deaths, and 750 clients underwent open-heart surgeries. By 2014, the number of CABG procedures reached 941, the number of CABG procedures had increased thrice since 2000. CABG accounts for 85% of all open-heart surgeries, making it the main technique used to treat CVD in the region (Bsharat & Karadag, 2019).

The patient is immediately transferred to the coronary cardiac unit (CCU) following CABG surgery, where they are closely monitored using a variety of medical tools, including electrocardiogram monitors, arterial and central lines, ventilators, and chest tubes (Gregory & McGowan, 2016; Hardin & Kaplow, 2019). Chest tubes are used to drain fluid, air, and pus from the pleural or mediastinal regions within the chest cavity after CABG surgery. This procedure aids in avoiding future heart and lung problems (Chandrababu et al., 2019).

However, ICU patients have reported chest tube removal (CTR) as an extremely painful and stressful procedure (Gorji et al, 2014). This process can be uncomfortable and distressing for patients, thus highlighting the significance of implementing interventions that effectively reduce pain during and after CTR. The neurohormonal and physiological responses can be negatively affected by the pain that occurs during CTR (Jose, 2020). Catecholamines are released, and the sympathetic nervous system is activated, resulting in high blood pressure, fast heart rate, accelerated breathing, and increased cardiac oxygen demand. (Hardin & Kaplow, 2019).

These alterations may result in reduced left ventricular function and insufficient blood flow to the heart muscle, resulting in myocardial ischemia (Mohammadi et al., 2018). Additionally, the pain experienced after CABG surgery can hinder effective

inhalation, potentially contributing to pulmonary complications after the operation and ultimately impacting overall health outcomes (Hardin & Kaplow, 2019).

Persistent pain may stimulate the body's stress response, resulting in the production of chemicals such as glucagon and cortisol. These hormone releases are linked to insulin resistance and high blood sugar levels, which are early signs indicating the importance of implementing a pain management plan (Mohammadi et al., 2018).

Most postoperative patients report moderate to severe pain, according to studies. Consequently, there needs to be a greater emphasis on providing proper pain management and avoiding undesirable effects (Gregory & McGowan, 2016).

Nurses play a crucial role in helping patients who are experiencing discomfort by managing their pain. Scientists have investigated the impact of various non-pharmacological methods, such as music therapy and rapid relaxation techniques, in alleviating pain during CTR (Demir & Khorshid, 2010), foot reflexology massage (Chandrababu et al., 2019), cold therapy, hearing a beloved person’s voice and SDBRE (Salmani et al., 2017).

Feelings of anxiety and discomfort can arise from the pain that is often linked to the CTR. Anxiety, fear, and other unpleasant emotional experiences are common in patients after interventional cardiovascular procedures, mainly related to CTR (Fasihizadeh & Nasiriani, 2020; Hani, 2023). The rate of anxiety after open heart surgery in patients ranges from 24.7 to 66. %. After cardiac procedures, patients may feel high levels of fear and anxiety because surgical procedures are often complex and dangerous and serious complications can occur (Akhlaghi et al., 2021).

Anxiety and discomfort can arise from CTR pain, triggered by the sympathetic nervous system's activation, which lead to increases heart rate, blood pressure, respiration, and muscle tension. Critical care nurses manage pain using non-pharmacological methods like cold application and SDBRE, instead of opioids and NSAIDs, which can cause side effects such as respiratory distress, itching, and gastrointestinal hemorrhage (Mokadem et al., 2017).

Anxiety triggers a stress response in ICU clients, which increases cortisol levels, pulse rate, and breathing, while potentially increasing blood pressure and metabolic rate. These changes can slow down recovery. Additionally, anxiety can lead to cognitive decline, mood swings, and longer hospital stays, which may increase the risk of complications and negatively impact overall recovery and quality of life (Ma et al., 2024).

SDBRE, a widely used relaxation technique employed by nurses to alleviate pain in patients undergoing CTR, is characterized as one of the simplest methods. It is a non-invasive, cost-effective, time-efficient, and safe method of pain management that takes 5 to 15 minutes (Sajedi-Monfared et al., 2021). This technique involves inhaling air through the nose and exhaling slowly through partially closed lips, commonly known as the pursed-lip exercise. Additionally, implementing SDBRE can improve pain response, reduce adverse clinical and financial consequences, and decrease reliance on analgesics while mitigating their potential side effects. Further, it targets multiple dimensions of pain, including cognitive, behavioral, and affective dimensions (Morone & Weiner, 2013).

The existing literature has provided evidence of the beneficial effect of SDBRE in reducing pain levels during CTR. In a randomized control trial conducted by (Gorji et al., 2014) the study aimed to compare the effects of cold therapy and relaxation on pain levels among patients who had undergone CABG surgery. The results indicated that both interventions, relaxation and cold therapy, had an equivalent effect. Those in both intervention groups reported considerably less pain than those in the control group ($P = 0.001$). Likewise, an experimental study was conducted involving 120 patients aged between 19 and 65 years, to compare the effects of cold applications and breathing relaxation therapy on pain levels during CTR It mean the results When compared to those in the control group, those who received the intervention saw a significant decrease in pain levels at three separate time periods (immediately, 15 minutes, and 30 minutes after CTR) (Mokadem et al., 2017).

1.2 Problem Statement

Patients undergoing CABG surgery frequently experience significant pain and anxiety during and after CTR, which is a standard post-surgery procedure. CTR impacts clients physiologically and psychologically, causing severe pain, anxiety, decreased comfort, and physiological changes (Seçer & Yayla, 2024). Despite various pain management strategies, there is a clear need for non-pharmacological interventions that can alleviate pain and anxiety during this critical post-operative period. Due to their low risk of harm and potential for enhancing patient comfort, SDBRE have shown promise as a potential solution (Jarrah et al., 2022). The effect of SDBRE on pain levels and anxiety levels during and after CTR, on the other hand, has received little focus, particularly in West Bank hospitals the study seeks to evaluate the effect of SDBRE on

pain levels and anxiety level during and post CTR after CABG, addressing the existing gap in research. The key problem identified is the suboptimal pain and anxiety management for these patients, and the study aims to fill this gap by evaluating the effectiveness of relaxation techniques in the Palestinian healthcare context. Objective of this study was to evaluate the effect of SDBRE in alleviating pain among post-CABG surgery patients during their recovery from CTR in Palestine.

1.3 Significance of the Study

This study is important because it evaluate the potential benefits of a relaxation exercise called SDBRE in reducing pain and anxiety levels during and post CTR after CABG surgery. CABG surgery is a major procedure that can cause significant pain and discomfort, while CTR involves removing a tube inserted into the chest, which can also be painful. Anxiety is common in patients undergoing CABG or other cardiac procedures (Jarrah et al., 2022).

SDBRE is a simple and non-invasive relaxation technique that has been shown to effectively reduce pain and anxiety in different settings (Jarrah et al., 2022). However, there is limited research on its use specifically in the context of CABG surgery and CTR. This study has the potential to contribute significantly to the field of cardiac surgery and pain management by providing evidence of the effectiveness of SDBRE in reducing pain and anxiety during CTR post CABG surgery. The results could be used to develop new interventions and guidelines for pain and anxiety management in this setting.

This study is significant because it could raise awareness of the importance of relaxation techniques in pain and anxiety management. Relaxation techniques are often overlooked as complementary or alternative therapies, but they can be a safe and effective way to reduce pain, anxiety, and improve overall health (Vambheim et al., 2021).

This study well-designed study has the potential to make a significant contribution to the fields of cardiac surgery and pain management. The results of this study have the potential to contribute to the creation of evidence-based interventions that can be integrated into regular clinical practice, thereby optimizing patient outcomes and improving the overall quality of care in the field of cardiac surgery.

The study on SDBRE's application in CABG surgery offers important vision for researchers and policymakers. It can inspire further research on pain management and

physiological mechanisms behind relaxation techniques. Policymakers could consider integrating SDBRE into standard care protocols to improve patient outcomes and reduce healthcare costs. The study could also guide policy recommendations for promoting complementary therapies in healthcare settings.

1.4 Study Objectives

1.4.1 Main Objectives

To evaluate the effect of SDBRE on pain levels and anxiety level during and post CTR following CABG in Nablus hospitals.

1.4.2 Specific Objectives

1) To determine the differences between control group and intervention group regarding pain during and post CTR.
2) To determine the differences between control group and intervention group regarding anxiety during and post CTR.
3) To determine the relationship between demographic data and the effect of SDBRE on pain and anxiety levels during and post CTR following CABG surgery.

1.4.3 Research Questions

1) Are there differences between the control group and the intervention group regarding level of pain during and post CTR?
2) Are there differences between the control group and the intervention group regarding level anxiety during and post CTR?
3) Is there a significant relationship between demographic data and the effect of SDBRE on pain and anxiety levels during and post CTR?

1.4.4 Study Hypothesis

1) There are no significant differences between control group and intervention group regarding pain during and post CTR was measured by Numeric pain scale at a p value <0.05.
2) There are no significant differences between the control group and intervention group regarding anxiety during and post CTR was measured by the Anxiety level visual analog scale at a p-value <0.05.

3) There is no significant relationship between demographic data and the effect of SDBRE on pain levels and anxiety level during and post- CTR after CABG surgery, as measured by a p-value less than 0.05.

1.5 Conceptual Framework of the Study

Figure (1.1) illustrates the conceptual framework of the study. It shows the independent variables (the SDBRE intervention and standard care for control) and their effect on pain and anxiety levels during and after chest tube removal (dependent variables). It also shows both demographic data and other medical factors.

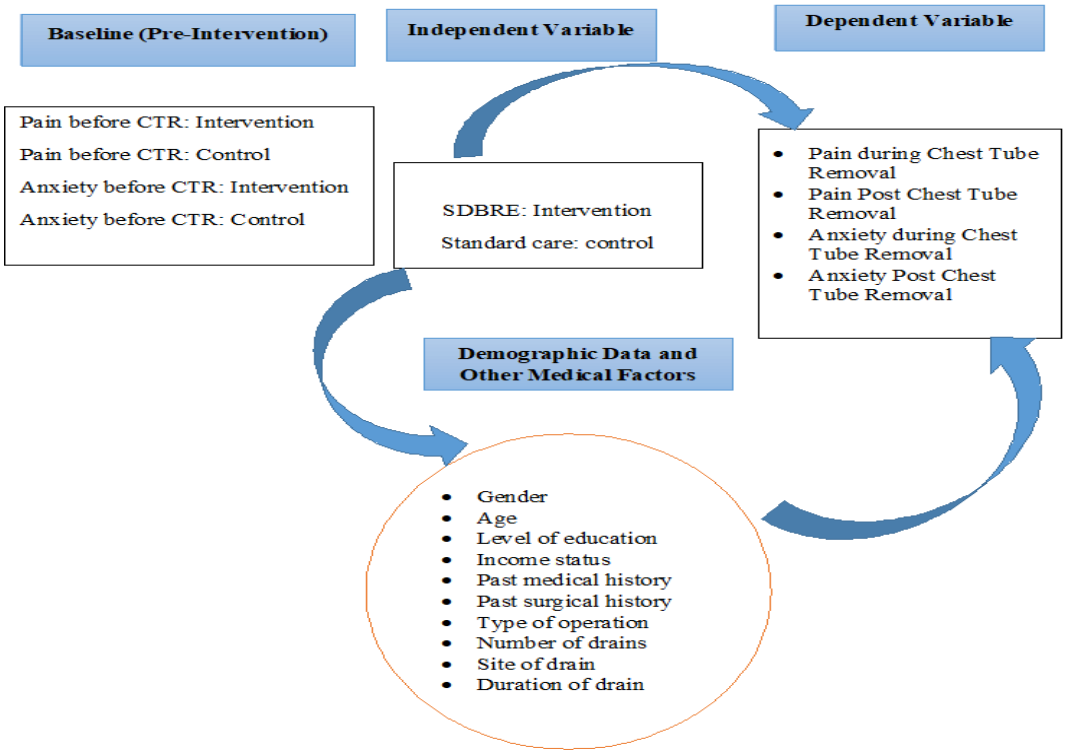

Figure 1.1: The Conceptual Framework of the Study.

1.6 Conceptual and Operational Definitions

1.6.1 The Conceptual Definition of SDBRE

The conceptual definition is breathing in slowly through the nose and then out through the mouth using the diaphragm (the thin muscle that separates the chest from the abdomen) and abdominal muscles. This helps boost the amount of oxygen in the

blood, lowers blood pressure and heart rate, and reduces muscle tension (Jarrah et al., 2022).

SDBRE, a yogic technique, promotes relaxation and voluntary control over autonomic nervous activity via repeated practice, which benefits in the treatment of psychological diseases and overall well-being (Sellakumar & Research, 2015).

SDBRE is a technique that involves inhaling through the nose and expelling through the mouth using pursued lips. It provides control over oxygenation and ventilation, increasing the period of expiration in comparison to regular breathing. This approach generates back pressure, which results in a tiny positive end-expiratory pressure (PEEP) (Nguyen & Duong, 2019).

1.6.2 The Operational Definition of SDBRE

The operational definition in the present study refers to the exercise that was trained to the intervention group to perform during and after chest tube removal**.** SDBRE is one of the easiest relaxation techniques that nurses apply to alleviate pain for clients during CTR. It is also a non-invasive, affordable, time-saving, harmless, and pain-relieving 5 to 15-minute approach that includes inhaling air through the nose and exhaling it slowly with the lips semi-closed (pursed-lip exercise) (Jarrah et al., 2022).

The steps include deep, slow inhalation through the nose, holding the breath for approximately three seconds, and then exhaling slowly through semi-closed pursed lips for two to three seconds, with the exhalation being at least three times as long as the inhalation. This process is repeated for 10 deep breathing cycles. Patients are instructed to sit with a relaxed posture, back straight, legs uncrossed, and hands on their abdomen to facilitate proper breathing. The technique begins 5 minutes before the procedure, with patients focusing on an object or closing their eyes to enhance relaxation. Patients were trained on how to conduct the breathing exercise upon admission, prior to CABG surgery (Jarrah et al., 2022).

1.6.3 The Conceptual Definition of Pain

It is defined by International Association for the Study of Pain (IASP)'s Taxonomy Committee as follows: "Pain refers to an unpleasant combination of sensory and emotional experiences that arise due to actual or potential harm to tissues, or described in relation to such harm (Gupta et al., 2010).

1.6.4 The Operational Definition of Pain

The operational definition of pain in present study is defined as measure pain that was measure by using of numeric rating scale (NRS) (Hawker et al., 2011). The study utilized NRS, to evaluate clients' pain levels during three phases: before CTR (Time 1), immediately and 5-min post CTR (Time 2), and 15-min post CTR (Time3) to compare the intervention effect between the two groups (Jarrah et al., 2022).

According to IASP, NRS was employed to allow participants to describe their own pain experience, with 0 representing no pain, 1-3 representing mild pain, 4-6 representing moderate pain, and 7-10 representing severe pain. The scale is designed to evaluate the effects of SDBRE on pain severity (Eldin et al., 2015).

NRS is a standardized 11-point a unidimensional numerical scale used to evaluate pain severity. The scale can be presented vocally or graphically to the patient, and in both situations, patients must rate their pain on a scale of 0 to 10, with 0 representing no pain and 10 being the greatest suffering possible.11 The categorical cutoff points for the NRS were mild (1-4), moderate (5-6), and severe (7 to 10), as previously described (Vaidya et al., 2021).

1.6.5 The Conceptual Definition of Anxiety

In the context of this study, anxiety refers to a complex psychological and emotional state marked by elevated levels of apprehension, fear, unease, and anxiety felt by patients during the procedure (Chand et al., 2021).

1.6.6 The Operational Definition of Anxiety

The operational definition of anxiety **is** to measure and evaluate anxiety levels in this study, anxiety was evaluated using the Anxiety Level Visual Analog Scale (VAS), an easy-to-use and reliable instrument for measuring patient anxiety before, during, and after surgical procedures (Williams et al., 2010; Woods et al., 2023).

The Anxiety VAS is very basic 6-point tool showing six faces, each expressing an increasing amount of anxiety, ranging from no anxiety (a neutral expression) to the maximum level of anxiety (a face displaying extreme terror). It seems to be a reliable tool for evaluating the intensity of acute state anxiety and could be easily integrated into routine clinical practice without significantly increasing the workload of healthcare staff caring for surgical patients (Cao et al., 2017).

The study utilized the Anxiety VAS to evaluate clients' anxiety levels during three phases: before CTR (Time 1), immediately and 5-min post CTR (Time 2), and 15-min post CTR (Time3) to compare the intervention effect between the two groups. The Anxiety VAS appears to be a valid tool for assessing the severity of acute anxiety, as it involves observing the patient's facial expressions, with the healthcare provider monitoring these cues to evaluate anxiety levels (Cao et al., 2017).

VAS consists of six faces, each representing a different level of anxiety. Face, one indicates no anxiety (a neutral expression), while face two represents mild anxiety (levels 1-2). Face three corresponds to mild-moderate anxiety (levels 3-4), and face four represents moderate anxiety (levels 5-6). Face five shows moderate-high anxiety (levels 7-8), and face six indicates high anxiety (levels 9-10). This scale provides a visual representation to help assess varying degrees of anxiety in patients (Yumul et al., 2024).

Chapter Two: Literature Review

2.1 Introduction

Pub- Med, Google Scholar databases were used in the search for SDBRE on pain and anxiety levels during and after open heart and CABG surgery in Nablus hospital in North West bank hospitals related articles using the keywords of "Coronary artery bypass graft surgery, chest tube, relaxation exercise and slow deep breathing relaxation exercise" In this chapter, we will offer a group of studies and articles, to see the results of what others found, and compare their studies strong and weak points.

A review of literature from 2011 to 2023 reveals significant research around the effect of SDBRE on pain and anxiety levels during and after CTR in patients undergoing CABG surgery. A total of 23 studies have evaluated the effect of SDBRE on pain management and anxiety reduction during CTR, with findings consistently supporting the technique's effectiveness.

2.2 Coronary Artery Bypass Graft Surgery and Chest Tube Removal

Ischemic heart disease (IHD) is a common and serious disease that affects people all over the world. If it is not handled properly and promptly, it can have fatal consequences (Schwartz, 2012). In fact, 17.9 million people died each year as a result of a chronic heart disease (CHD) (Bradley & Berry, 2022).

CABG is a surgical procedure used to treat ischemic heart muscle that is affected by a blocked coronary artery by re-perfusing that area with blood via a vascular graft that bypasses and connects that area with blood (Alexander & Smith, 2016). It treats the heart by re-perfusing the cardiac muscle, making it one of the most effective interventions for relieving IHD symptoms (Bradley & Berry, 2022).

CABG is an important medical procedure performed to treat coronary artery disease (CAD), a condition characterized by narrowing or blockage of the coronary arteries that supply blood. For heart muscle the main goal of CABG is to restore proper blood flow to the heart by bypassing clogged or narrowed arteries. This is achieved by grafting healthy blood vessels, usually taken from the patient's body (such as the saphenous vein or internal mammary artery), into the affected coronary arteries (Caliskan et al., 2020).

During cardiac surgery, a chest tube is employed to eliminate secretions and enhance cardiac performance. Typically, this tube is extracted within the initial 24 to 48

hours following the surgery (Ghazali et al., 2021). Clients have reported negative experiences with CTR after cardiac surgery. According to studies, individuals who had CTR reported moderate to severe pain, which was unfortunately poorly treated (Hani & Practice, 2023). Because of the pleura's strong supply of sensory fibers, the pain associated with CTR can generate fear and anxiety, leading in sensations of burning, sharp, and pressure (Ertuğ & Ulker, 2012).

According to the study, removing the chest tube as soon as possible—within 24 hours of surgery is a safe and efficient way to lessen discomfort. Helps patients recover more quickly after CABG surgery. Studies further demonstrate that there is no increased risk of problems with early removal of the chest tube. 307 patients were divided into two groups and were assigned to have their chest tubes removed either immediately following surgery (group 1) or 48 to 72 hours later (group 2). Following surgery, patients were monitored for 30 days. According to the study's findings, removing the chest tube as soon as possible after CABG is a safe and efficient method of easing discomfort and promoting better patient recovery (Sadeghi et al., 2009).

Systematic review and meta-analysis: In 2023, the study was published in the Baltimore Journal of Medicine. A total of 2,447 patients from 15 trials were analyzed by the researchers Research conducted a comparison between usual therapy (thoracotomy after 48 to 72 hours) and early CTR (within 24 hours following surgery). Early removal of the chest tube was linked to a shorter hospital stay (mean difference, -1.34 days; 95% confidence range, -2.34 to -0.34 days) and a decrease in pain (mean difference, -2.14 points on a 10-point scale), according to the study's findings. The scale (points: -3.23 to -1.05, 95% confidence range). The likelihood of problems was the same for both groups. Early removal of the chest tube is a safe and effective way to reduce discomfort and decrease hospital stays following CABG, according to the researchers' findings. (Zhu et al., 2023).

A prospective study using randomization (2022) in this trial, 150 patients were randomly assigned to have their chest tubes removed either 48 or 72 hours (group 2) or within 24 hours after stopping the CABG pump (group 1). Studies demonstrate that removing the chest tube as soon as possible following off-pump CABG is a safe and efficient way to Decreasing pain and enhance patient recovery. (Zurek et al., 2021).

Meta-analysis and systematic review" (2021) in this analysis, ten trials comparing conventional treatment (thoracotomy after 48 hours of surgery) versus early chest tube resection (within 24 hours of surgery) were examined. The studies ranged from 48 to 72

hours following minimally invasive thoracic bypass surgery. According to a study, early removal of the chest tube is linked to a shorter hospital stay and reduced pain, but there is no evidence of a difference in the risk of complications (Zurek et al., 2021).

During the first three months post the surgery, it is common that some patients develop physical and psychological signs and symptoms such as pain in the surgical site, fluid retention, fatigue short term cognitive impairment, nervousness, depressed feelings, lack of control, and dependency (Alexander & Smith, 2016).

2.3 Effect of SDBRE on Pain Levels during and Post CTR after CABG Surgery

SDBRE is one of the most basic relaxation methods used by nurses to help patients manage with discomfort during CTR. It is also a 5 to 15-minute non-invasive, accessible, time saving, risk-free, and pain-relieving therapy that includes breathing air through the nose and gently expelling it with the lips semi-closed (pursed-lip exercise). Deep breathing refers to a state devoid of any physical, mental, or emotional strain, which can effectively aid in the control of pain from both physiological and psychological perspectives (Mohamed et al., 2022).

From a physiological standpoint, relaxation brought about by deep breathing results in a decrease or even reversal of the sympathetic pain response, leading to lowered oxygen consumption, blood pressure, heart rate, and respiration. On a psychological level, relaxation incorporates the element of distraction, which plays a vital role in pain management by reducing cognitive awareness of the pain (Mohamed et al., 2022). The current research supports the beneficial effects of SDBRE in reducing pain levels during CTR. A randomized control trial was conducted by (Gorji et al., 2014).

A study was aimed to examine the effects of cold therapy and relaxation techniques on pain levels in patients who underwent CABG surgery. The findings revealed that both relaxation and cold treatment were equally beneficial. When compared to the control group, patients in both intervention groups reported considerably lower pain levels (P value = 0.001). Another research, which included 120 patients aged 19 to 65, compared the effects of cold treatments and SDBRE on pain levels during CTR. In comparison to patients in the control group, patients in the intervention group observed a statistically significant reduction in pain levels

immediately, 15 minutes, and 30 minutes after CTR (P value 0.001) (Sajedi-Monfared et al., 2021).

A quasi-experimental study found that patients who received breathing relaxation treatment experienced significantly lower pain levels than the control group at three separate time points (immediately, 15 minutes, and 30 minutes after CTR). The observed reduction in pain level was statistically significant ($P < 0.001$) (Mokadem et al., 2017).

A randomized controlled trial (RCT) demonstrated a significant reduction in pain levels during cardiac thoracic rehabilitation (CTR) after CABG surgery with the implementation of SDBRE, as opposed to the conventional treatment approach employed in the intensive care unit (ICU). Therefore, it is advised that healthcare facilities adopt SDBRE and adhere to pharmacological therapy guidelines during CTR in order to enhance patient satisfaction and improve overall clinical outcomes (Jose, 2020).

In Arab country, a study conducted in Egypt revealed that the intervention of relaxation techniques resulted in improved performance levels among patients in the study group. Additionally, the relaxation technique showed a significantly positive impact in reducing pain intensity during CTR following cardiac surgery for the study group, in comparison to the control group (Mohamed et al., 2022).

A study was conducted in Jordan to assess the effectiveness of the SDBRE in decreasing patients' pain levels during CTR following CABG surgery. The level of pain suffered by the patients in the control and intervention groups both statistically significantly decreased with time. Compared to the control group, the intervention group experienced much less pain. Additionally, the use of SDBRE during CTR is a useful method for decreasing pain, helping to reduce the need for analgesics and the side effects that go along with its contents (Jarrah et al., 2022).

On the contrary, proficient management of pain after surgery promotes the healing process, alleviates patient distress, and reduces the duration of hospitalization (Göttgens et al., 2011). Pain treatment strategies, both pharmacological and non-pharmacological, in hand. Opioids and Non-steroidal anti-inflammatory medications, for example, are frequently associated with adverse effects such as dyspnea (shortness of breath), nausea, and gastrointestinal bleeding. Consequently, alternative methods for pain treatment are often chosen (Olapour et al., 2013). Acupressure, therapeutic massage, muscular relaxation, cryotherapy, transcutaneous electrical nerve stimulation (TENS), and

including SDBRE into one's routine are a variety of non-pharmacological ways to pain management (Imani & Rahimzadeh, 2012).

2.4 Effect of SDBRE on Anxiety Levels during and Post CTR after CABG Surgery

Anxiety and inconvenience are unfavorable feelings resulting from the pain associated with the CTR, SDBRE can help patients cope with the anxiety that comes with having a chest tube removed (Naseri, 2015). Anxiety, and other unpleasant emotional reactions are frequent among patients following CTR-related cardiovascular interventional treatments. The process is described as "distressing" by patients. As well as "fearful" (Chandrababu et al., 2019).

Many patients experience severe stress when there doesn't seem an indication of inadequately managed procedural pain. Patients' prognosis and recovery may suffer as a result of their increased anxiety (Yarahmadi et al., 2018).

The study conducted in the ICU of the Cardio-Thoracic Academy Affiliated to Ain Shams University Hospital in Cairo using a quasi-experimental approach. The study included 60 patients who had undergone cardiothoracic surgery and had at least two chest tubes in situ. Structured interviews, pain assessment instruments, and a checklist for breathing exercises were used to collect data. Methods were used figure jumped to 95% after 10-15 minutes of chest tube removal. When cold application and breathing exercises were included during CTR, anxiety levels decreased with 58.3% of patients having low anxiety, increasing to 91.7% within 10-15 minutes after CTR (Elmetwaly & El Sayed, 2020).

A study was conducted in the Department of Cardiothoracic and Vascular Surgery (CTVS), in both the CTVS ward and ICU at King George's Medical University (KGMU) in Lucknow. This study evaluated the effects of cold therapy and SDBRE on pain and anxiety levels during and after CTR in CABG surgery clients. The quasi-experimental design included 60 participants, with an intervention group receiving cold therapy and SDBRE and a control group receiving standard treatment. The SDBRE group showed significantly decrease anxiety levels than the other groups ($p<0.05$). There was no significant difference in pain levels during chest tube removal ($p>0.05$), but both interventions significantly reduced post-removal pain (cold application: 1.60 ± 0.50, SDBRE: 2.40 ± 0.51, vs. control: 3.55 ± 1.05) ($p<0.05$). Cold therapy proved to

be more efficient than SDBRE in alleviating pain ($p<0.05$). The study revealed that both approaches are secure, effective, and affordable for managing (Chauhan et al., 2021).

This clinical trial, conducted at Imam Khomeini Hospital in Tehran, Iran, examine the impact of cold application and SDBRE on pain and anxiety associated with CTR in clients who had undergone open-heart surgery. A total of 120 participants were randomly assigned to four groups: control, cold application, SDBRE, and a combined intervention group. Pain and anxiety levels were measured using the NRS before, immediately after, and 15 minutes post CTR. The results revealed that neither cold application nor SDBRE significantly decrease pain or anxiety compared to the control group. While pain intensity increased immediately after CTR in all groups, there were no significant differences in pain or anxiety scores between the interventional and control groups at any specific period. The inability to provide a calm environment for respiratory exercises in the intensive care department, combined with the difficulties some elderly participants faced in performing the exercises, may have affected the results. The study indicated that cold application and SDBRE were inadequate for relieving CTR-related pain and anxiety, and it advised that more research should be performed with bigger sample sizes and alternate techniques for pain and anxiety therapy (Sajedi-Monfared et al., 2021).

A study conducted at Menoufia University Hospital aimed to evaluate the effects of cold therapy and SDBRE on pain and anxiety levels during CTR in cardiac surgery clients. The study included 120 clients in the surgical ICU and utilized a quasi-experimental design. Pain intensity was assessed using the VAS, and anxiety levels were measured using the Hamilton Anxiety Scale. The result showed a statistically significant decrease in both pain and anxiety in the groups that received cold application and SDBRE, compared to the control group. These findings highlight the efficacy of non-pharmacological strategies for treating pain and anxiety after CTR, emphasizing the importance of including such practices into professional guidelines for critical care nursing (Mokadem et al., 2017).

2.5 Literature Gap

According to recent research, patients having CABG surgery may have less discomfort during and after the removal of their chest tubes if they do SDBRE. To find the most effective technique to apply SDBRE, additional study is necessary. This involves choosing the most suitable moment, frequency, and duration of action.

Additionally, we must investigate whether the preoperative pain level, gender, and age of patients influence whether SDBRE is more effective for some than for others. In order to determine whether SDBRE is the best option, we should also compare it with alternative pain treatment techniques. Whether SDBRE offers long-term advantages beyond reducing pain during chest tube removal needs more research.

2.6 Summary

The numerous research studies that examined into how SDBRE impacted pain levels both during and after the removal of the chest tube following CABG surgery provided insight into the potential advantages of this straightforward yet effective technique. The results of this study indicate that including SDBRE in the postoperative care routine might significantly decrease the pain that patients feel after having their chest tubes removed.

Chapter Three: Methodology

3.1 Introduction

This chapter described the methodology that was used to carry out the study, which included the study design, site and setting, population, sample size and sampling method, eligibility criteria, data collection procedure, tools, validity and reliability, ethical considerations, and data analysis

3.2 Study Design

This research utilized experimental study design to efficiently evaluate the effects of SDBRE on pain and anxiety during and following CTR after CABG surgery. Targeted population and randomly divided into intervention and control groups to identify the differences in pain and anxiety between the two groups. The samples were collected from the beginning of March to October 2024.

3.3 Study Setting

The study was conducted within two prominent private hospitals in Nablus, located in the West Bank: Al-Arabi Specialized Hospital and Nablus Specialized Hospital, specifically in those that had open heart surgery patients admitted to the Cardiac Care Unit (CCU).

Al-Arabi Specialized Hospital, established in 1997, is one of the leading private medical institutions in the northern West Bank. It has a clinical capacity of 94 beds. The hospital has 10 beds in the CCU, with an average of more than 15 cardiac operation per month. It plays a critical role in providing specialized healthcare services to the local population.

Nablus Specialized Hospital, established in 2000, is a prominent private medical institution in the northern West Bank. It has a total of 54 beds, including 12 beds in the ICU and 5 beds in the CCU. On average, the hospital conducts no more than 10 heart surgeries each month. Additionally, it played a vital role in treating the wounded during the Second Intifada (Table 3.1)**.**

Table 3.1: The Distribution of Participants among the tow Nablus Hospitals

Name of City	Name of Hospital	Total Participants	Distribution of Participants in Intervention and Control Groups Across Hospital
Nablus	Specialized Arab Hospital	40 patients	Intervention Group 20 patients
			Control Group 20 patients
	Specialized Nablus Hospital	40 patients	Intervention Group 20 patients
			Control Group 20 patients

3.4 Population

The population included post open heart surgery patients admitted to a CCU wards.

3.5 Sampling and Sample Size

By using a G-power software, with a two-tailed t-test for the difference between two independent means, the study's post hoc power analysis showed an 80.6% attained power, an effect size (Cohen's d) of 0.639, a significance level (α α) of 0.05, and equal sample sizes of 40 in each group (Table 3.2)**.**

Table 3.2: Sample Size Calculation

t tests - Means: Difference between two independent means (two groups)	
Analysis: Post hoc: Compute achieved power	
Input: Tail(s)	= Two
Effect size d	= 0.639
α err prob	= 0.05
Sample size group 1	= 40
Sample size group 2	= 40
Output: Noncentrally parameter δ	= 2.8576949
Critical t	= 1.9908471
Df	= 78
Power (1-β err prob)	= 0.8057617

3.5.1 Inclusion Criteria

1) Patients who were hemodynamically stable.
2) Patients with age 18 years or above because perception of pain in pediatrics was complex, and entailed physiological, psychological, behavioral, and developmental factors (Srouji, Ratnapalan, & Schneeweiss, 2010).
3) Patients who were not experiencing severe respiratory distress that may interfere with performing the slow deep breath exercise because the SDBRE, would cause hypercapnia and trigger chemoreceptor, mainly those located in brainstem (Nattie & Li, 2012) .

3.5.2 Exclusion Criteria

1) Patients who were unable to understand and follow commands, having no visual or auditory impairments because the participants were asked to sit in a relaxed, straight-back position supported by the bed, with their legs uncrossed. Verbal instructions and audiovisual materials demonstrating the technique were provided by the physiotherapist (Association, 2018).
2) Unconscious and disoriented patients because they were unable to understand, read, and provide informed consent to participate in the study.
3) Having had a chest tube for less than 24 h, because earlier remove of chest tube could had been an explanation for the decrease in pain perceived by this group (Mueller et al., 2000).

3.5.3 Randomization

The randomization sequence was used to distribute participants either in intervention group or control group. With 40 participants at each hospital, ratio of 1:1 between intervention and control. It was balanced, meaning that the number of participants assigned to each group was equal (Table 3.3)**.**

Table 3.3: Sequence of Randomization

Participant ID	Randomization Sequence	Group Assignment
1	24	Intervention
2	13	Control
3	9	Intervention
4	18	Control
5	6	Intervention
6	28	Control
7	15	Intervention
8	12	Control
9	22	Intervention
10	2	Control
11	30	Intervention
12	10	Control
13	19	Intervention
14	27	Control
15	8	Intervention
16	4	Control
17	21	Intervention
18	5	Control
19	16	Intervention
20	31	Control
21	14	Intervention
22	1	Control
23	20	Intervention
24	3	Control
25	7	Intervention
26	26	Control
27	11	Intervention
28	23	Control
29	17	Intervention
30	32	Control
31	25	Intervention
32	29	Control
33	40	Intervention
34	37	Control
35	35	Intervention
36	33	Control
37	39	Intervention
38	34	Control
39	36	Intervention
40	38	Control

3.6 Intervention

Training on the SDBRE technique was provided to participants upon admission before CABG surgery. They were instructed to practice the technique until they could perform it correctly and effectively. During the teaching session, clients were encouraged to ask questions. The SDBRE technique involves slow, deep inhalation through the nose, holding the breath for approximately 3 seconds, and then exhaling slowly through semi-closed pursed lips for at least 2 to 3 seconds, which is three times longer than the inhalation. According to the guidelines issued by the American Lung Association in 2018 (Association, 2018), clients will perform 10 deep breathing attempts with pursed lips exercises.

The SDBRE technique will be initiated 5 minutes before chest tube removal CTR. During the CTR, patients will be instructed to hold their breath. Additionally, clients will be asked to either close their eyes or focus on an object in the room while concentrating on their breathing and relaxing. The chest tube dressing and sutures will be removed while the clients continue with the relaxation technique.

Anxiety and pain levels were assessed at three phases: before CTR (Time 1), immediately and 5 minutes post CTR (Time 2), and 15 minutes post CTR (Time 3). Anxiety was measured using the Anxiety VAS, a valid tool that evaluates acute anxiety by observing facial expressions (Cao et al., 2017). Pain was measured using the NRS, a reliable method for assessing pain severity (Hawker et al., 2011; Jarrah et al., 2022). Both tools were used to compare the intervention effects between the two groups.

To reduce contamination in the sample collection, the control group and intervention group were separated to ensure that patients from both groups did not meet at the same time. This separation was carefully implemented to ensure that patients in the control group were not exposed to or learned the technique used in the intervention group. This was facilitated by the relatively low number of CABG cases each month, as well as the extended duration of the data collection period. Additionally, during each visit, only one patient was enrolled, which helped maintain a clear separation between the two groups and further minimized the risk of contamination (Table 3.4).

Table 3.4: summarizes the key points of the SDBRE Intervention

Step	Description
Pre-Admission Training	Participants were trained on the SDBRE technique before CABG surgery. They were encouraged to practice until they could perform it correctly
SDBRE Technique Description	Slow deep inhalation through the nose, holding the breath for 3 seconds, then exhaling slowly through semi-closed pursed lips for 2 to 3 seconds, which is three times longer than inhalation
Breathing Attempts	10 deep breathing attempts with pursed lips were performed, following the American Lung Association guidelines (2018)
SDBRE Timing	SDBRE technique was initiated 5 minutes before chest tube removal (CTR).
Breathing Focus During CTR	Patients were instructed to hold their breath during CTR and were asked to either close their eyes or focus on an object while concentrating on breathing and relaxing.
Chest Tube Removal (CTR)	The chest tube dressing and sutures were removed while the patient continued with the relaxation technique.
Anxiety Assessment	Anxiety levels were measured using the VAS Anxiety scale before (Time 1), immediately after (Time 2), and 15 minutes post (Time 3) CTR
Pain Assessment	Pain levels were assessed using the NRS (0-10) scale before (Time 1), immediately after (Time 2), and 15 minutes post (Time 3) CTR
Group Separation	The control and intervention groups were separated to prevent contamination and ensure that patients from one group did not learn from the other.

3.7 Data Collection Tool

The researcher used questionnaire that contained three sections:

Part one: Demographic data which include age, gender, level of education, income.

Part two: Medical related factor:

1. Past medical history.
2. Past surgical history.
3. Type of operation.
4. Number of drains.
5. Site of drain.
6. Duration of drain.

Part three:

The numeric pain scale was used (Appendix 2)**,** and patients were asked to rate their pain on a scale from 0 to 10, where 0 indicated no pain, 5 represented moderate pain, and 10 indicated severe pain. The pain score was divided into three subscales: 1-3 for mild pain, 4-6 for moderate pain, and 7-10 for severe pain (Iohom, 2016).

Anxiety Level Visual Analog Scale

The Anxiety VAS (Appendix 3) was used to evaluate clients' anxiety levels during three phases: before CTR (Time 1), immediately and 5-min post CTR (Time 2), and 15-min post CTR (Time3), to compare the effects of the intervention between the two groups. The VAS features six faces, each representing a different level of anxiety, ranging from no anxiety (neutral expression) to high anxiety (levels 9-10). This scale allows healthcare providers to monitor and assess varying degrees of anxiety by observing the patient's facial expressions (Cao et al., 2017; Yumul et al., 2024).

3.7.1 Validity and Reliability of Data Collection Tool

3.7.1.1 Reliability

Test-retest reliability: The consistency of pain ratings over time can be assessed by using the Numeric Pain Rating Scale (NPRS) on the same group of patients on two separate occasions, at intervals with reasonable space in between. The high correlation between the two sets of scores indicates good test-retest reliability (Alghadir et al., 2018; Cheatham et al., 2018).

Inter-rater reliability: If multiple health care professionals use the NPRS, inter-rater reliability can be assessed to ensure that different raters provide scores similar

number of pains for the same patient. This can be assessed by having multiple raters rate the pain of the same patient and checking for consistency (Modarresi et al., 2022).

3.7.1.2 Validity

Content validity looked at how well the NPRS measures the type of pain it was designed to assess. This established by checking with professionals in the field of pain assessment and making sure the scale contains appropriate components and descriptions of pain(Begum & Hossain, 2019). And Construct to assess statistical techniques and by examining how well the scale aligns with other measures of pain (Tsze et al., 2018). The NPRS has been shown to have good test-retest reliability (r=.79–.96) and is a valid and reliable measurement of pain severity (Alghadir et al., 2018; Cheatham et al., 2018).

The studies evaluated the reliability, validity, and sensitivity of the computerized VAS measuring anxiety and found that the computerized VAS had adequate psychometric properties, including item reliability Test-retest and convergent accuracy with other measures of anxiety (Abend et al., 2014; Fernández-Sogorb et al., 2018). A pilot study was conducted to check reliability and validity of instruments and effectiveness of intervention tool.

3.7.2 Data Collection Procedure

3.7.2.1 Intervention Group

A total of 40 patients were included in the study, with 20 patients from Nablus Specialized Hospital and 20 patients from Al-Arabi Specialized Hospital. They received SDBRE in addition to the standard care, which served as the control group, before CTR. The SDBRE involves slow and deep inhalation through the nose, followed by holding the breath for approximately 3 seconds, and then exhaling slowly through semi-closed pursed lips for at least 2 to 3 seconds, which is three times longer than the inhalation. As per the guidelines issued by the American Lung Association in 2018 (Association, 2018) patients performed 10 deep breathing attempts with pursed lips exercises. In the intervention group, the SDBRE technique was initiated 5 minutes before chest tube removal. Patients were instructed to either close their eyes or focus on an object in the room and concentrate on their breathing while relaxing.

The removal of the chest tube dressing and sutures took place while the patient continued with the relaxation technique. During CTR, patients were instructed to hold

their breath. Prior to receiving the SDBRE, the purpose and method of performing the deep breathing relaxation therapy were explained to the patients in the interventional group. They were asked to sit in a relaxed, straight-back position supported by the bed, with their legs uncrossed. Verbal instructions and audiovisual materials demonstrating the technique were provided by the physiotherapist. The participants were trained on how to perform the breathing exercise upon admission before CABG surgery. They practiced the technique repeatedly until they could perform it correctly and effectively, and they were encouraged to ask questions during the teaching session.

After CTR, the patient's pain levels were assessed using the NRS, ranging from 0 (no pain) to 10 (the worst pain imaginable). The patients were asked to rate their pain on this scale, with 0 representing no pain, 5 indicating moderate pain, and 10 signifying severe pain. The pain was assessed using the NRS, which is one of the simplest and most commonly used scales. The numerical scale typically ranges from 0 to 10, with 0 representing "no pain" and 10 representing "the worst pain imaginable" (Iohom, 2016). The patient was asked to rate the pain from 0 to 10 and was informed that 0 meant no pain, 5 indicated moderate pain, and 10 represented severe pain.

After CTR, the patient's anxiety levels were assessed using the visual analog scale (VAS-A). The severity of anxiety was categorized as follows: Not Anxious (0), Mild Anxiety Level (1-3), Moderate Anxiety Level (4-6), and Severe or Extremely Severe Anxiety Level (7-10).

3.7.2.2 Control Group

A total of 40 patients were included in the study, with 20 patients from Nablus Specialized Hospital and 20 patients from Al-Arabi Specialized Hospital. These patients met the participant selection criteria and formed the control group, undergoing CTR following standard care procedures. The control group was managed using a medical protocol within the designated unit, alongside regular nursing activities that involved continuous assessment of patients, including monitoring, reporting, and documenting vital signs and physical-psychological responses.

The control group measurements and assessment tools were conducted in a manner similar to those used for the intervention group. Following the CTR procedure, pain levels were evaluated using the numeric rating scale. Patients were asked to rate their pain on a scale from 0 to 10, where 0 indicated no pain, 5 represented moderate pain, and 10 indicated severe pain. Anxiety levels in the control group were assessed

using the visual analog scale (VAS-A) after CTR. The severity of anxiety was categorized as follows: Not Anxious (0), Mild Anxiety Level (1-3), Moderate Anxiety Level (4-6), and Severe or Extremely Severe Anxiety Level (7-10). Figure (3.1) shows the flow of the study.

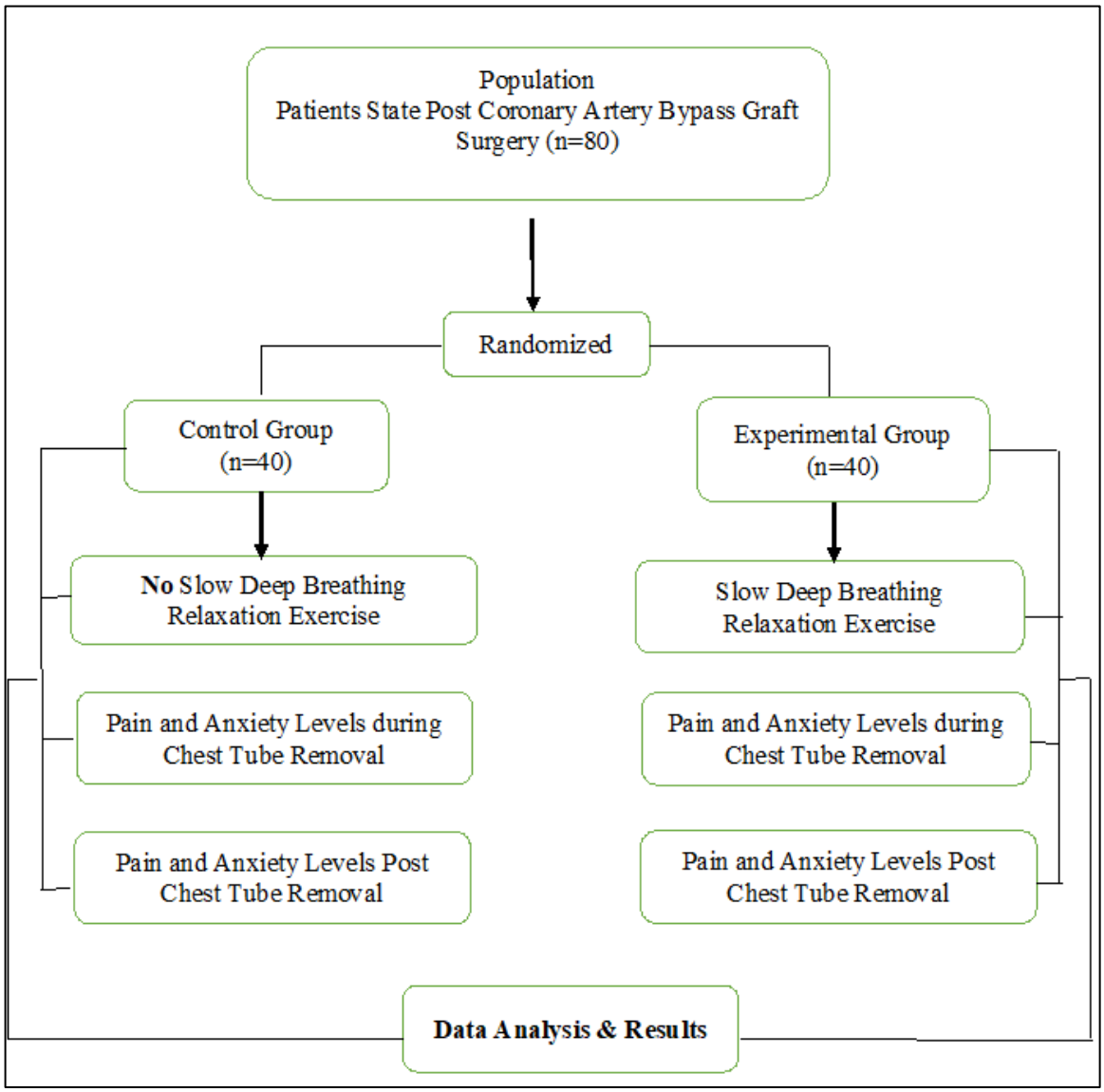

Figure 3.1: The Flow of the Study

3.8 Data Analysis

Statistical analysis was performed using SPSS version 21. The data analysis aimed to evaluate the effect of SDBRE on pain levels and anxiety level during and post CTR after CABG. Descriptive statistics were used to summarize demographic and clinical data, including mean, standard deviation, and Pain severity analysis. In terms of tests of normality, nonparametric alternatives such as Mann-Whitney test and Spearman correlation were used because the data were not normally distributed.

All p-values for the Shapiro-Wilk and Kolmogorov-Smirnov tests were below the significance level ($p < 0.05$), as indicated in Table (3.5) and (Appendix 4). This suggests that there is a deviation from a normal distribution in the data for every group in every situation. This finding could suggest that non-parametric tests be considered for additional data analysis.

Anxiety and pain levels during and after CTR were compared in each group (intervention and control) using Mann-Whitney U tests. The purpose of this test was to assess hypothesis #1 and #2 by identifying any changes in pain and anxiety during and after CTR between the control group and the intervention group. Spearman correlation was used to test the hypotheses #3&4 to determine the relationship between demographic data and medical factor and the effect of SDBRE on pain and anxiety levels during and post CTR after CABG surgery. All statistical tests were two-sided and the significance level $p < 0.05$ is considered statistically significant.

Table 3.5: Data Normality Tests

	Group	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	P	Statistic	df	P
Pain During Removal of Chest Tube	Control	0.228	40	0.000	0.902	40	0.002
	Intervention	0.203	40	0.000	0.909	40	0.003
Pain Post Removal of Chest Tube	Control	0.256	40	0.000	0.877	40	0.000
	Intervention	0.344	40	0.000	0.800	40	0.000
Anxiety During Removal of Chest Tube	Control	0.240	40	0.000	0.900	40	0.002
	Intervention	0.223	40	0.000	0.915	40	0.005
Anxiety Post Removal of Chest Tube	Control	0.171	40	0.005	0.923	40	0.009
	Intervention	0.241	40	0.000	0.874	40	0.000

3.9 Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of the Arab American University (IRB-AAUP) (Appendix 1), with the code number "R-2024/B/34/N," and was approved by the research ethics committee. Participants were provided with a verbal and written explanation regarding the purpose, methods, and significance of the study. Consent forms were obtained prior to participation. The participants were informed that their data would be kept confidential and anonymous, and that choosing not to participate would not affect their care. Additionally, they were informed of their right to withdraw from the study or discontinue completing the questionnaire at any time without explanation or negative consequences. Participants

were assured that their involvement, including the use of SDBRE in the study, was safe and would not cause harm.

3.10 Pilot Study

A pilot study was conducted to check the reliability and validity of pain scale and anxiety scale. 10% (n=8) of total population was piloted (n=80). The results showed a statistically significant difference in pain between the intervention and control groups during (p=0.018) and after (p=0.036) CTR, as determined by the Mann-Whitney U Test. There was a significant difference in anxiety levels between the intervention and control groups during CTR (p=0.025) and after (p=0.037). Test-Retest Reliability was used to measure the stability of the pain and anxiety scales over two times (during and post CTR). There was a significant correlation between during and post CTR pain and anxiety.

The results of the pilot study indicated that the pain and anxiety measures had good validity and reliability, as demonstrated by the high correlation coefficients between the two variables during and after CTR and the substantial P-values for the differences between the intervention and control groups (Table 3.6; Table 3.7)

Table 3.6: Level of Pain & Anxiety among the Intervention & the Control Groups (n=8)

	Group	N	Mean Rank	Z	P
Pain during CTR	Intervention	4	2.50	-2.366	0.018
	Control	4	6.50		
Pain post CTR	Intervention	4	2.75	-2.097	0.036
	Control	4	6.25		
Anxiety during CTR	Intervention	4	2.63	-2.247	0.025
	Control	4	6.38		
Anxiety post CTR	Intervention	4	2.75	-2.084	0.037
	Control	4	6.25		

Table 3.7: Spearman's Correlations between during and post CTR Pain and Anxiety

		Pain post CTR	Anxiety post CTR
Pain during CTR	Correlation Coefficient	0.810	
	Sig. (2-tailed)	0.015	
Anxiety during CTR	Correlation Coefficient		0.955
	Sig. (2-tailed)		0.000

3.11 Summary

This chapter describes the methodology to be used in the study on the effects of slow deep breathing with relaxation exercise (SDBRE) on anxiety and pain during and after chest tube removal (CTR) after coronary artery bypass graft (CABG) surgery.

The experimental design included intervention and control groups, and was carried out in two private hospitals in Nablus—Al-Arabi Specialized Hospital and Nablus Specialized Hospital. The study specifically aimed at post-CABG patients admitted to CCUs; a randomized sample of 80 participants was chosen and equally distributed between the hospitals.

Eligibility criteria included hemodynamically stable patients 18 years or older; exclusions included those with impairments or chest tubes removed in less than 24 hours. Subjects in the intervention group received training in SDBRE, which emphasized controlled breathing techniques, whereas the control group received usual care. Pain and anxiety were measured at three phases using the Numeric Rating Scale (NRS) and Visual Analog Scale (VAS).

Data was analyzed using SPSS version 21, utilizing t-tests and non-parametric methods where appropriate for within-group and between-group differences. Ethical approval and informed consent were obtained with participant confidentiality and rights to withdraw at any stage ensured.

This is a very clear, ethical, systematic approach to the evaluation of the impact of SDBRE, and it sets an excellent foundation for credible research outcomes.

Chapter Four: Results

4.1. Introduction

This chapter presents the findings of the study through comprehensive statistical analysis and interpretation of participant responses. The results provide details about descriptive statistics of participant characteristics, mean scores of pains and anxiety during and after CTR among both control and intervention groups. Also, it highlights the significant differences between both groups that emphasized the effectiveness of SDBRE techniques on pain and anxiety during and after CTR.

4.2. The Baseline Characteristics of the Intervention and Control Groups

Before the intervention, the control and intervention groups' baseline characteristics were examined to ensure their independence.

4.2.1 Hospital, Gender, Education, Income and Smoking

According to data in Table (4.1), there was no significant difference between the intervention and control groups, as evidenced by all p-values exceeding the significance level (p-values > 0.05). This implies that the groups were independent, comparable, and balanced in terms of smoking, income, education, gender, and hospital before the intervention.

Table 4.1: The Baseline Characteristics of the Intervention and Control Groups regarding to Hospital, Gender, Education, Income and Smoking

Variable	Category	Group	N	% within Category	% within Group	P Value
Hospital	Nablus Specialized	Control	20	50.0%	50.0%	0.588
		Intervention	20	50.0%	50.0%	
	Specialized Arab	Control	20	50.0%	50.0%	
		Intervention	20	50.0%	50.0%	
Gender	Male	Control	34	51.5%	85.0%	0.385
		Intervention	32	48.5%	80.0%	
	Female	Control	6	42.9%	15.0%	
		Intervention	8	57.1%	20.0%	
	High School	Control	14	43.8%	35.0%	
		Intervention	18	56.2%	45.0%	
	Diploma	Control	10	71.4%	25.0%	
		Intervention	4	28.6%	10.0%	

Education	Bachelor	Control	11	42.3%	27.5%	0.242
		Intervention	15	57.7%	37.5%	
	Master or above	Control	5	62.5%	12.5%	
		Intervention	3	37.5%	7.5%	
Income	Low	Control	10	66.7%	25.0%	0.293
		Intervention	5	33.3%	12.5%	
	Middle	Control	22	44.0%	55.0%	
		Intervention	28	56.0%	70.0%	
	High	Control	8	53.3%	20.0%	
		Intervention	7	46.7%	17.5%	
Smoking	Yes	Control	35	51.5%	87.5%	0.378
		Intervention	33	48.5%	82.5%	
	No	Control	5	41.7%	12.5%	
		Intervention	7	58.3%	17.5%	
P values were based on Chi Square Test						

4.2.2. Age and Body Mass Index

According to data in Table (4.2), there was no significant difference between the intervention and control groups, as evidenced by all p-values exceeding the significance level (p-values > 0.05). This implies that the groups were independent, comparable, and balanced in terms of age and BMI before the intervention.

Table 4.2: Mean Scores and Mean Ranks of Age and BMI across Intervention and Control Groups

Variable	Group	N	M	SD	Mean Rank	P
Age	Intervention	40	57.10	8.21	42.28	0.494
	Control	40	55.55	9.55	38.73	
BMI	Intervention	40	26.81	3.05	38.23	0.379
	Control	40	27.47	3.38	42.78	
P Values were based on Mann-Whitney U Test BMI= Body Mass Index, N = Size, M = Mean, SD = Standard Deviation						

4.2.3. The Distribution of Past Medical History across the Intervention and Control Groups

With 67.5% in the intervention group and 47.5% in the control group, diabetes mellitus with hypertension is the most prevalent of past medical history (PMH). The control group has a greater proportion of more complicated illnesses, such as mitral valve disease (MVD), acute kidney injury (AKI), ischemic heart disease (IHD), and diabetes mellitus (DM). There were people in both groups who had no prior medical history (free), although the control group had a higher percentage (5.0%) than the

intervention group (2.5%). According to data in Table (4.3), there was no significant difference between the intervention and control groups, as evidenced by all p-values exceeding the significance level (p-values > 0.05). This implies that the groups were independent, comparable, and balanced in the distribution of past medical histories before the intervention.

Table 4.3: The Distribution of PMH across the Intervention and Control Groups

PMH	Group	N	% within PMH	% within Group
AVD	Intervention	3	75.0%	7.5%
	Control	1	25.0%	2.5%
CAD, DM, HTN	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
DM	Intervention	1	50.0%	2.5%
	Control	1	50.0%	2.5%
DM, HTN	Intervention	27	58.7%	67.5%
	Control	19	41.3%	47.5%
DM, HTN, Gout	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
DM, HTN, Hepatitis B	Intervention	1	100.0%	2.5%
	Control	0	0.0%	0.0%
DM, HTN, Hyperthyroidism	intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
DM, HTN, IHD	Intervention	2	33.3%	5.0%
	Control	4	66.7%	10.0%
DM, HTN, IHD, Gout	Intervention	1	100.0%	2.5%
	Control	0	0.0%	0.0%
DM, HTN, IHD, AKI	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
DM, HTN	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
DM, IHD	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
Free	Intervention	1	33.3%	2.5%
	Control	2	66.7%	5.0%
HTN	Intervention	3	75.0%	7.5%
	Control	1	25.0%	2.5%
HTN, IHD	Intervention	1	33.3%	2.5%
	Control	2	66.7%	5.0%
HTN, A-Fib	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
MRD	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
MVD	Intervention	0	0.0%	0.0%
	Control	2	100.0%	5.0%
P value was 0.47 (based on Chi Square)				

4.2.4. The Distribution of PSH across the Intervention and Control Groups

The most prevalent status, reported by 75.0% of the control group and 77.5% of the intervention group, is free from past surgical history (PSH). The control group is the only one that has some operations, including laminectomy and gastric sleeves. Only the intervention group experienced percutaneous coronary intervention (PCI) (5.0%). A precise comparison of the surgical histories of the two groups is ensured by this breakdown. According to data in Table (4.4), there was no significant difference between the intervention and control groups, as evidenced by all p-values exceeding the significance level (p-values > 0.05). This implies that the groups were independent, comparable, and balanced in the distribution of past surgical histories before the intervention.

Table 4.4: The Distribution of PSH across the Intervention and Control Groups

PSH	Group	N	% within PSH	% within Group
Appendectomy	Intervention	2	66.67%	5.0%
	Control	1	33.33%	2.5%
Cholecystectomy	Intervention	1	33.33%	2.5%
	Control	2	66.67%	5.0%
Cholecystectomy, Bi-Lateral Hernia	Intervention	1	100.0%	2.5%
	Control	0	0.0%	0.0%
Colonoscopy with Polypectomy	Intervention	1	100.0%	2.5%
	Control	0	0.0%	0.0%
Cataract	Intervention	1	100.0%	2.5%
	Control	0	0.0%	0.0%
Free	Intervention	31	50.8%	77.5%
	Control	30	49.2%	75.0%
Gastric sleeve	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
Hysterectomy	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
Laminectomy	Intervention	0	0.0%	0.0%
	Control	2	100.0%	5.0%
Hernia	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
Mini Gastric Bypass	Intervention	0	0.0%	0.0%
	Control	1	100.0%	2.5%
PCI	Intervention	2	100.0%	5.0%
	Control	0	0.0%	0.0%
Prostatectomy	Intervention	1	50.0%	2.5%
	Control	1	50.0%	2.5%
P value was 0.45 and based on Chi Square test				

4.2.5. The Distribution of Different Types of Operations across the Intervention and Control Groups

The most common procedure was CABG*3, which represented 30.0% of the intervention group and 35.0% of the control group. The MVR rate of the control group was 7.5%, while that of the intervention group was 2.5%. According to data in Table (4.5), there was no significant difference between the intervention and control groups, as evidenced by all p-values exceeding the significance level (p-values > 0.05). This implies that the groups were independent, comparable, and balanced in the distribution of different types of operations before the intervention.

Table 4.5: The Distribution of Different Types of Operations across the Intervention and Control Groups

Type of Operation	Group	N	% within Type of Operation	% within Group
AVR With CABG	Intervention	2	66.7%	5.0%
	Control	1	33.3%	2.5%
CABG*1	Intervention	1	50.0%	2.5%
	Control	1	50.0%	2.5%
CABG*2	Intervention	7	50.0%	17.5%
	Control	7	50.0%	17.5%
CABG*3	Intervention	12	46.2%	30.0%
	Control	14	53.8%	35.0%
CABG*4	Intervention	9	60.0%	22.5%
	Control	6	40.0%	15.0%
CABG*5	Intervention	6	54.5%	15.0%
	Control	5	45.5%	12.5%
CABG*6	Intervention	2	40.0%	5.0%
	Control	3	60.0%	7.5%
MVR With CABG	Intervention	1	25.0%	2.5%
	Control	3	75.0%	7.5%

P value was 0.903 (based on Chi Square)
AVR = Aortic Valve Replacement; CABG = Coronary Artery Bypass Graft; MVR = Mitral Valve Replacement
*1, *2, *3, *4. *5, *6 = Numbers of Grafted Vessels

4.2.6. Variables Related to Chest Tube across the Intervention and Control Groups

Table (4.6) presents a descriptive statistic about numbers, sites and duration of drains across the intervention and control groups.

4.2.6.1. Numbers of Drains

52.3% of people in the intervention group had two drains, compared to 47.7% in the control group. 52.8% of the control group had three drains, compared to 47.2% of the intervention group. There was no statistically significant difference between the two groups' drain counts (p-value = 0.411).

4.2.6.2. Site of Chest Tube

In the intervention group, 77.8% of the left pleura and midsternal chest tube sites were seen, compared to 22.2% in the control group. The intervention group had 60.0% of the left pleural and pericardial sites, while the control group had 40.0%. It was the same in both groups (50.0%) for those with (Right Pleura, Left Pleural, Midsternal). 46.4% of the intervention group and 53.6% of the control group had (Right Pleural, Left Pleural, Pericardial). 50.0% of each group was located at the (left and right pleura) sites. 58.3% in the control group and 41.7% in the intervention group at the right pleural, midsternal location. There was no statistically significant difference between the two groups' drain locations, as indicated by the p-value of 0.471.

4.2.6.3. Duration of Drain

Over the course of two days of draining, the intervention group accounted for 46.2% of the total, whereas the control group comprised 53.8%. Over the course of three days of draining, the intervention group accounted for 53.8% of the total, whereas the control group comprised 46.2%. Over the course of four days, the intervention group had 100% drains, but the control group experienced none. The two groups' period of drain use did not differ statistically significantly, according to the p-value of 0.292.

Table 4.6: Variables Related to Chest Tube across the Intervention and Control Groups

Numbers of Drains	Group	N	% within Number of Drains	% within Group
2	Intervention	23	52.3%	57.5%
	Control	21	47.7%	52.5%
3	Intervention	17	47.2%	42.5%
	Control	19	52.8%	47.5%
P value = 0.411(based on Chi Square)				
Site of Drains	Group	N	% within Site of Drains	% within Group
Left Pleura, Midsternal	Intervention	7	77.8%	17.5%
	Control	2	22.2%	5.0%
Left Pleura, Pericardial	Intervention	3	60.0%	7.5%
	Control	2	40.0%	5.0%
Right Pleura, Left Pleura, Midsternal	Intervention	4	50.0%	10.0%
	Control	4	50.0%	10.0%
Right Pleura, Left Pleura, Pericardial	Intervention	13	46.4%	32.5%
	Control	15	53.6%	37.5%
Right Pleura, Left Pleura	Intervention	3	50.0%	7.5%
	Control	3	50.0%	7.5%
Right Pleura, Midsterna	Intervention	10	41.7%	25.0%
	Control	14	58.3%	35.0%
P value = 0.471 (based on Chi Square)				
Duration of Drain	Group	N	% within Duration of Drain	% within Group
2 days	Intervention	24	46.2%	60.0%
	Control	28	53.8%	70.0%
3 days	Intervention	14	53.8%	35.0%
	Control	12	46.2%	30.0%
4 days	Intervention	2	100.0%	5.0%
	Control	0	0.0%	0.0%
P value = 0.292 (based on Chi Square)				

4.3. The Vital Signs of the Intervention and Control Groups

As shown in (Table 4.7), the intervention group had greater systolic blood pressure than the control group, but a lower diastolic blood pressure. These were the primary differences between the two groups. With only little variations in temperature, SaO2, respiratory rate, and heart rate, the other vital indicators were comparatively comparable amongst the groups.

Table 4.7: The Vital Signs of the Intervention and Control Groups

Vital Signs	Group	M	SD
Systolic BP (mmHg)	Intervention	146.33	157.01
	Control	130.76	8.65
Diastolic BP (mmHg)	Intervention	70.45	7.92
	Control	79.75	9.59
Heart Rate (HR)	Intervention	80.03	7.46
	Control	84.48	7.47
Respiratory Rate (RR)	Intervention	19.60	3.98
	Control	20.98	3.51
Temperature (°C)	Intervention	36.74	0.377
	Control	36.74	0.579
SaO2 (%)	Intervention	97.63	1.148
	Control	97.53	1.340
Data were based on Mean (M) and Standard Deviation (SD)			

4.4. Level of Pain and Anxiety among the Control and Intervention Groups

4.4.1 Level of Pain and Anxiety before Removal of Chest Tube among Control and Intervention Groups

Prior to the removal of the chest tube, the intervention group's pain level (2.925 ± 1.248) and the control group's (3.200 ± 1.265) did not differ significantly, according to p-values (0.346). Anxiety levels prior to chest tube removal did not significantly differ between the intervention (2.450 ± 1.197) and control groups (2.625 ± 1.170), as indicated by p-values (0.516) (Table 15).

4.4.2 The Level of Pain and Anxiety during and Post Removal Chest Tube across Intervention and Control Groups

(Table 4.8) attempted to test hypotheses #1 and #2 that proposed:

Hypothesis #1: There are no significant differences between control group and intervention group regarding pain during and post chest tube removal that was measured by Numeric pain scale at a p value <0.05.

Hypothesis #2: There are no differences between the control group and intervention group regarding anxiety during and post chest tube removal that was measured by the Anxiety level visual analog scale at a p-value <0.05.

The p-values for hypothesis #1 and #2 were less than 0.05, as indicated in Table (4.8.) This indicates that the intervention groups mean pain scores during chest tube removal (5.325 ± 0.997) and the control group's (7.125 ± 0.939) were statistically different. Additionally, there were significant differences between the intervention group's mean pain levels after chest tube removal (2.125± 0.723) and the control group's (3.575± 0.903). In both situations, the intervention group's pain scores were lower.

The intervention group mean anxiety scores during chest tube removal (4.650 ± 1.350) and the control group's (6.100 ± 1.008) were statistically different. Additionally, there were significant differences between the experimental group's mean anxiety levels after chest tube removal (1.400 ± 1.105) and the control group's (2.825± 1.279). In both situations, the experimental group's anxiety scores were lower.

Table 4.8: The Level of Pain and Anxiety Pre, During and Post Removal Chest Tube across Intervention and Control Groups

	Group	N	M	SD	Mean Rank	Z	P
Pain Pre-Removal of Chest Tube	Intervention	40	2.925	1.248	38.13	-0.942	0.346
	Control	40	3.200	1.265	42.88		
Pain During Removal of Chest Tube	Intervention	40	5.325	0.997	24.65	-6.257	0.000
	Control	40	7.125	0.939	56.35		
Pain Post Removal of Chest Tube	Intervention	40	2.125	0.723	25.31	-6.110	0.000
	Control	40	3.575	0.903	55.69		
Anxiety Pre-Removal of Chest Tube	Intervention	40	2.450	1.197	38.36	-0.650	0.516
	Control	40	2.625	1.170	42.14		
Anxiety During Removal of Chest Tube	Intervention	40	4.650	1.350	27.75	-5.037	0.000
	Control	40	6.100	1.008	53.25		
Anxiety Post Removal of Chest Tube	Intervention	40	1.400	1.105	28.34	-4.796	0.000
	Control	40	2.825	1.279	52.66		
P Values were based on Mann-Whitney U Test N = Size, M = Mean, SD = Standard Deviation							

4.5. The Correlation between Demographic Data and the Effect of SDBRE on Pain and Anxiety Levels during and Post-Chest Tube Removal

(Table 16) attempts to test hypotheses #3.

Hypothesis #3: There is no significant relationship between demographic data and the effect of SDBRE on pain and anxiety levels during and post-chest tube removal after CABG, as measured by a p-value less than 0.05.

4.5.1. Demographic Data

All p-values were above 0.05, indicating that there was no significant correlation between gender and anxiety or pain levels. Since p-values were more than 0.05, there was no significant correlation between age and pain or anxiety levels. Anxiety or pain levels did not significantly correlate with type of hospital. Anxiety post chest tube removal and educational level showed a marginally significant correlation (r = -0.312, p = 0.050), but not strongly affecting the overall hypothesis validation. There were no significant correlations between income and anxiety or pain (Table 16).

4.5.2. Other Medical Factors

There was no significant relationship between other medical factors (BMI, smoking, number of drains) and the effect of SDBRE on pain and anxiety levels during and post CTR after CABG surgery (Table 4.9).

Table 4.9: The Correlation between Demographic Data and Other Medical Factors and the Effect of SDBRE on Pain and Anxiety Levels during and Post CTR

Variables	Correlation	Pain During CTR	Pain Post CTR	Anxiety During CTR	Anxiety Post CTR
Gender	(r)	0.155	0.193	0.158	0.226
	(P)	0.338	0.233	0.330	0.162
Age	(r)	-0.183	-0.156	-0.075	-0.100
	(P)	0.259	0.337	0.647	0.540
Hospital	(r)	-0.002	0.040	0.050	0.125
	(P)	0.989	0.806	0.761	0.443
Education	(r)	-0.081	-0.107	-0.259	-0.312
	(P)	0.620	0.512	0.106	0.050
Income	(r)	0.129	0.206	0.170	0.093
	(P)	0.429	0.202	0.294	0.569
BMI	(r)	0.062	0.136	-0.033	-0.137
	(P)	0.702	0.401	0.838	0.400
Smoking	(r)	-0.164	-0.136	-0.211	-0.072
	(P)	0.311	0.402	0.190	0.659

Number of drains	(r)	-0.165	-0.020	0.119	0.163
	(P)	0.309	0.901	0.466	0.315
P values were based on Spearman's Correlation					

4.5.3. Correlation of Past Medical and Surgical Histories, Type of Operation, Site and Duration of Chest Tube with Pain and Anxiety Levels

The statistical significance (p-values) of multiple factors with respect to the degree of pain and anxiety experienced during and after chest tube removal are shown in Table (4.10). All p-values were above 0.05, indicating that there were no significant correlations between prior medical and surgical histories and pain or anxiety levels during or after removal. There were no significant relationships with pain after removal or with anxiety levels, as p-values were well above 0.05, but there was a significant relationship with pain during removal ($p = 0.000$), indicating that the type of operation had a significant impact on pain levels during the procedure. There was no a significant correlation between the drain site and either pain or anxiety during or after removal. The duration of the drain and the amount of pain experienced during removal were significantly correlated ($p = 0.01$), suggesting that the length of time the drain was in place may have an effect on the amount of pain experienced during removal. There was a significant correlation with anxiety after removal ($p = 0.007$) as well, indicating that a longer duration can result in higher anxiety levels afterward.

Table 4.10: Correlation of Past Medical and Surgical Histories, Type of Operation, Site and Duration of Chest Tube with Pain and Anxiety Levels

Factor		Pain During Removal	Pain Post Removal	Anxiety During Removal	Anxiety Post Removal
Past Medical History	P- value	0.100	0.33	0.20	0.92
Past Surgical History	P- value	0.78	0.91	0.23	0.35
Type of Operation	P- value	0.000	0.94	0.16	0.44
Site of Drain	P- value	0.09	0.74	0.1	0.33
Duration of Drain	P- value	0.01	0.75	0.1	0.007
P values based on Chi Square Test					

The surgery type and degree of pain during chest tube removal are compared in Table (4.11). The operations include mitral valve replacement (MVR), aortic valve replacement (AVR), and several kinds of coronary artery bypass graft (CABG) procedures (depending on the quantity of grafts). The range of pain levels is 3 to 7.

Less people experienced the lower pain levels (3 and 4), which made up a smaller percentage of the total. Just one MVR With CABG patient (2.5% of the total) reported having a level of pain of 3. The majority of patients with CABG * 3 and CABG * 4 (7.5% and 5.0% of the total, respectively) reported having pain level 4.

With 15 patients (37.5% of the total), Pain Level 5 was the most commonly reported pain level. Patients having CABG * 3 (15.0%) were the most likely to have it, followed by CABG * 1 and CABG * 4 (5.0% and 7.5%, respectively). Although in smaller percentages (5.0% and 2.5% of the total, respectively), AVR With CABG and CABG * 2 patients also reported this level of pain.

Twelve patients (30.0%) reported having pain at level 6. CABG * 4 and CABG * 5 were most associated with this pain level (10.0% and 7.5%, respectively). CABG * 1 and CABG * 3 also reported pain at this level, but with lower frequencies. Only 5 patients (12.5%) reported this high level 7 of pain. Predominantly observed in patients with CABG * 1, CABG * 3, and CABG * 6, each contributing 2.5% to the total (Figure 1).

Table 4.11: Type of Operation and Pain and Anxiety Levels

Type of Operation		Pain during CTR				
		3.00	4.00	5.00	6.00	7.00
AVR With CABG	Count	0	0	2	0	0
	% of Total	0.0%	0.0%	5.0%	0.0%	0.0%
CABG * 1	Count	0	0	1	0	0
	% of Total	0.0%	0.0%	2.5%	0.0%	0.0%
CABG * 2	Count	0	0	2	2	3
	% of Total	0.0%	0.0%	5.0%	5.0%	7.5%
CABG * 3	Count	0	3	6	2	1
	% of Total	0.0%	7.5%	15.0%	5.0%	2.5%
CABG * 4	Count	0	2	3	4	0
	% of Total	0.0%	5.0%	7.5%	10.0%	0.0%
CABG * 5	Count	0	2	1	3	0
	% of Total	0.0%	5.0%	2.5%	7.5%	0.0%
CABG * 6	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	2.5%	2.5%
MVR With CABG	Count	1	0	0	0	0
	% of Total	2.5%	0.0%	0.0%	0.0%	0.0%
Total	Count	1	7	15	12	5
	% of Total	2.5%	17.5%	37.5%	30.0%	12.5%

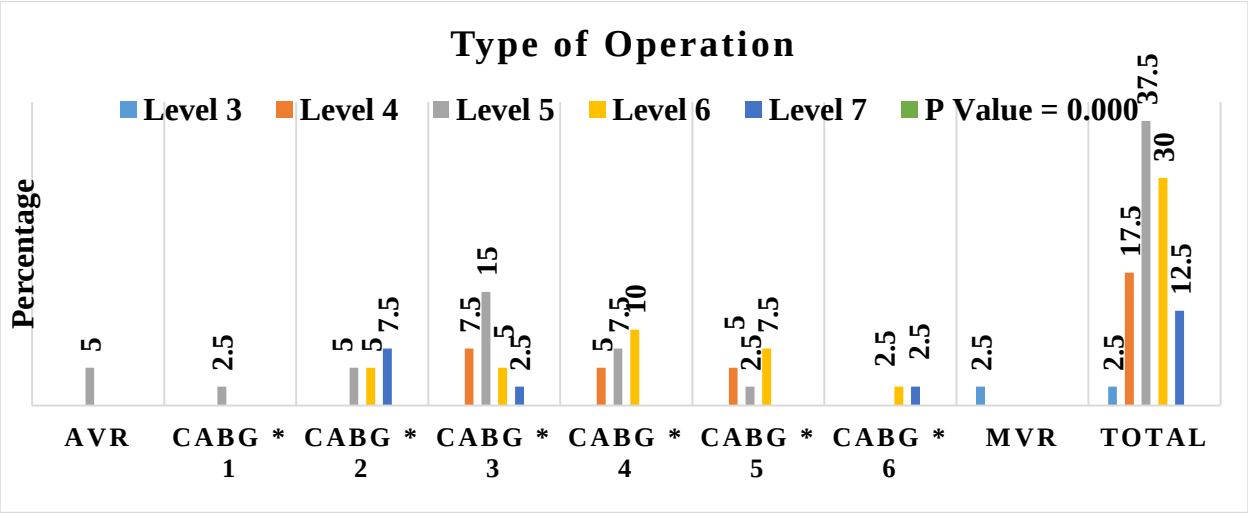

Figure 4.1: Level of Pain during Chest Tube Removal

The correlation between the length of the drain (two, three, or four days) and the degree of pain experienced following chest tube removal is shown in Table (4.12). With 24 patients, the most frequent duration was two days. Pain level 6 had the highest frequency (10 patients, or 25.0% of the total). Notable counts were also found for pain levels 5 and 4 (20.0% and 7.5%, respectively). At pain levels three (2.5%) and seven (5.0%), lower frequencies were seen. With 14 cases, the second most frequent length was three days. Pain levels four and five had the highest frequencies. Four patients (10.0% of the total) had pain level 4. Seven patients (17.5% of the total) had pain level 5. Pain levels 6 and 7 had lower numbers (5.0% and 2.5%, respectively). With just two patients, the four-day duration was the least popular. Pain level 7 (5.0% of the total) was recorded by both patients, indicating that longer drain times may result in more pain.

Table 4.12: Duration of Drain and Pain Levels

Duration of Drain		Pain During Removal of Chest Tube				
		3.00	4.00	5.00	6.00	7.00
Two days	Count	1	3	8	10	2
	% of Total	2.5%	7.5%	20.0%	25.0%	5.0%
Three days	Count	0	4	7	2	1
	% of Total	0.0%	10.0%	17.5%	5.0%	2.5%
Four days	Count	0	0	0	0	2
	% of Total	0.0%	0.0%	0.0%	0.0%	5.0%
Total	Count	1	7	15	12	5
	% of Total	2.5%	17.5%	37.5%	30.0%	12.5%

The relationship between anxiety levels following chest tube removal and the length of the drain is examined in Table (4.13). Two days was the most typical length, involving twenty-four patients. The distribution of anxiety levels was as follows: The most common report was for Level 1 (10 patients, or 25.0% of the total). Five individuals, or 12.5% of the total, reported having level 0 anxiety, which is also typical. Six and three patients, respectively, reported Levels 2 and 3 (15.0% and 7.5%).

With fourteen cases, the second most frequent length was three days. The majority of these patients' anxiety levels were at Level 1 (6 individuals, or 15.0% of the total). Three patients (7.5%) reported having level 0 anxiety. Three and two patients, respectively, expressed anxiety levels of two and three (7.5% and 5.0%).

With just two patients, the four-day duration was the least prevalent. Levels 2 and 5 of anxiety were reported. Anxiety Level 2 was reported by one patient (2.5% of the total). Anxiety Level 5, the greatest level recorded overall durations, was reported by another patient at 2.5% of the total.

Table 4.13: Duration of Drain Anxiety Levels

Duration of Drain		Anxiety Post Removal of Chest Tube				
		0.00	1.00	2.00	3.00	5.00
Two days	Count	5	10	6	3	0
	% of Total	12.5%	25.0%	15.0%	7.5%	0.0%
Three days	Count	3	6	3	2	0
	% of Total	7.5%	15.0%	7.5%	5.0%	0.0%
Four days	Count	0	0	1	0	1
	% of Total	0.0%	0.0%	2.5%	0.0%	2.5%
Total	Count	8	16	10	5	1
	% of Total	20.0%	40.0%	25.0%	12.5%	2.5%

4.6 Summary of Results

The results showed that the intervention and control groups' pain scores during and after CTR differed significantly. The pain score was lower in the intervention group. The intervention group benefited from significant differences in anxiety levels during and after CTR compared to the control group. Medical variables such as BMI, smoking status, or the number of drains did not substantially correspond with the effects of SDBRE on pain and anxiety levels. There was a strong correlation between the kind of operation and the level of discomfort during CTR; more complicated procedures (such CABG with multiple grafts) were associated with higher levels of pain. Anxiety after removal and higher levels of pain during removal were substantially linked to longer chest tube insertion times.

Chapter Five: Discussion

5.1. Introduction

This chapter discusses the study's findings, contrasting them with previous research and looking at possible explanations. The main topics include the effects of Slow Deep Breathing Relaxation Exercise on anxiety and pain management during and after chest tube removal, as well as the correlations between the results and medical and demographic characteristics.

This study aimed to evaluate the effect of slow deep breathing relaxation exercise on pain levels and anxiety level during and post chest tube removal after coronary artery bypass graft surgery in Northwest Bank hospitals. Conveniently, two groups were chosen from two distinct Northwest Bank hospitals. Each group had forty patients. Random selection was used to choose the intervention and control groups from both hospitals. The intervention group was kept apart from the control group during the intervention.

There were no significant variations between the intervention and control groups in this study's demographics or other medical factors. Because of this homogeneity, any variations in the degree of pain and anxiety experienced before and following chest tube removal can be related to the SDBRE intervention rather than changes in demographics.

According to all p-values that were higher than the significance level (p-values > 0.05), there was no a statistically significant difference between the intervention and control groups in terms of their baseline characteristics. In terms of smoking, income, education, gender, age, BMI and hospitalization, this suggests that the groups were independent, comparable, and balanced before the intervention (Table 2; Table 3).. There was no significant difference between the intervention and control groups in terms of the distribution of prior medical and surgical histories, as indicated by all p-values exceeding the significance level (p-values > 0.05). According to this, before the intervention, the groups were independent, comparable, and evenly distributed (Table 4.4; Table 5).

Prior to the intervention, the groups' allocation of various operation types was also balanced, independent, and comparable. Drain counts (p-value = 0.411), drain locations (p-value = 0.471), and drain length (p-value = 0.292) did not differ statistically significantly between the two groups(Table 6; Table 7).

5.2 Pain Levels Before, During and After Chest Tube Removal

Due to the removal of the chest tube, patients who had CABG operations were anticipated to feel moderate to severe CTR pain (Hani, 2023). Patients in this study also experienced moderate pain in the intervention group (5.325 ± 0.997) compared to severe pain in the control group (7.125 ± 0.939). These average scores were estimated by the NPS.

Before the chest tube was removed, the intervention group's mean pain scores (2.925 ± 1.248) and the control group's (3.200 ± 1.265) were comparable. There was no significant difference found by the Mann-Whitney U test (Z = -0.942, p = 0.346), suggesting that the pain levels before the surgery were similar.

The study's findings showed that the intervention and control groups' ratings of chest tube pain during and after removal differed statistically significantly. The intervention group's mean score for pain during chest tube removal was (5.325 ± 0.997). The score of the control group (7.125 ± 0.939) was higher than intervention group. Additionally, there was a difference in the mean rankings between intervention (24.65) and control (56.35), with intervention having the lowest pain score. The p value highlighted that the various scores were statistically significant (P = 0.000) based on the Mann-Whitney U test.

After the removal of the chest tube, the intervention group's mean pain score was 2.125 ± 0.723. The intervention group's score was lower than the control group's (3.575 ± 0.903). Furthermore, intervention had the lowest pain score, with mean rankings differing between intervention (25.31) and control (55.69). According to the Mann-Whitney U test, the p value indicated that the different scores were statistically significant (P = 0.000).

According to the analysis's findings, patients who underwent SDBRE reported far less pain both during and after the removal of their chest tubes than those in the control group. This suggests the usefulness of SDBRE as a pain management strategy for patients following CABG operations is demonstrated by this finding, which also recommends that it may be used in clinical settings to lessen pain and improve recovery results. These findings highlighted the efficacy of non-pharmacological strategies like SDBRE for treating pain and anxiety after CTR, emphasizing the importance of including such practices into professional guidelines for critical care nursing (Mokadem et al., 2017).

The findings aligned with previous researches that claimed SDBRE was among the most fundamental relaxing techniques employed by nurses to assist patients in reducing pain during CTR (Mohamed et al., 2022). Patients who had CABG surgery reported significantly reduced pain levels in both intervention groups, according to a different RCT trial comparing the effects of cold therapy and relaxation techniques (Gorji et al., 2014). Another study examined how pain levels during CTR were affected by SDBRE. Immediately, 15 minutes, and 30 minutes following CTR, participants in the intervention group reported no a statistically significant decrease in pain levels compared to those in the control group (Sajedi-Monfared et al., 2021).

5.3 Anxiety Levels During and After Chest Tube Removal

The intervention group's pre-removal anxiety levels (2.450 ± 1.197) and the control group's (2.625 ± 1.170) were similar. There was not a significant difference (Z = -0.650, p = 0.516), suggesting that anxiety levels were comparable prior to the intervention.

The results of the study exhibited a statistically significant difference in the intervention and control groups' estimations of anxiety during and post removal. The average anxiety score for the intervention group during the removal of the chest tube was (4.650 ± 1.350). The intervention group's score was lower than the control group's (6.100 ± 1.008). Furthermore, the intervention group had the lowest anxiety score (27.75) compared to the control group (53.25), which had a difference in mean ranks. According to the Mann-Whitney U test, the p value indicated that the different scores were statistically significant (P = 0.000).

The average anxiety score for the intervention group after the removal of the chest tube was (1.400 ± 1.105). The intervention group's score was lower than the control group's (2.825 ± 1.279). Furthermore, the intervention group had the lowest anxiety score (28.34) compared to the control group (52.66), which had a difference in mean ranks. According to the Mann-Whitney U test, the p value indicated that the different scores were statistically significant (P = 0.000).

Unfavorable emotions brought on by the CTR's pain include anxiety and inconvenience. SDBRE can assist patients in managing the anxiety associated with having a chest tube removed (Naseri, 2015). Patients often experience anxiety and other negative emotional reactions after receiving cardiovascular interventional therapy associated to CTR. Patients refer to the procedure as "distressing" Additionally,

"fearful" (Chandrababu et al., 2019). When there is no apparent sign of poorly managed procedural pain, many patients suffer from extreme stress. Patients' elevated anxiety may negatively impact their prognosis and recovery (Yarahmadi et al., 2018). This study demonstrates the value of SDBRE as a method for managing anxiety in patients after CABG procedures and raises the possibility that it could be applied in clinical settings to reduce anxiety while also improving recovery outcomes. Compared to the control group, patients who participated in SDBRE reported significantly lower levels of anxiety during and after having their chest tubes removed. These findings were congruent with a study conducted in the ICU of the Cardio-Thoracic Academy Affiliated to Ain Shams University Hospital in Cairo using a quasi-experimental approach. Breathing exercises were one of techniques used during CTR. Anxiety levels were decreased with 58.3% of patients and this percentage was increased to 91.7% within 10-15 minutes after CTR (Elmetwaly & El Sayed, 2020).

Both pain and anxiety during and after CTR were positively impacted by SDBRE in this investigation. In previous quasi-experimental study, a control group received normal treatment, while an intervention group received cold therapy and SDBRE. Compared to the other groups, the SDBRE group's anxiety levels were noticeably lower. However, both therapies greatly decreased post-removal pain, and there was no significant difference in pain levels during chest tube removal (Chauhan et al., 2021).

This study was not congruent with a study was conducted at Imam Khomeini Hospital in Tehran, Iran that examined the impact of cold application and SDBRE on pain and anxiety associated with CTR in clients who had undergone open-heart surgery. The results revealed that neither cold application nor SDBRE significantly decrease pain or anxiety compared to the control group. While pain intensity increased immediately after CTR in all groups, there were no significant differences in pain or anxiety scores between the interventional and control groups at any specific period (Sajedi-Monfared et al., 2021).

5.4 Correlation with Demographic Data among Intervention Group

The effects of SDBRE on pain and anxiety levels did not significantly correlate with demographic characteristics. The statistics generally supported this, with p-values for the correlations between income, hospital type, age, and gender being over 0.05. But there was a slightly significant correlation between post-removal anxiety and

educational level (r = -0.312, p = 0.050). Although the influence was not significant enough to change the overall hypothesis, this shows that those with higher levels of education might benefit more from knowing and using relaxation techniques.

5.5 Correlation with Medical Factors among Intervention Group

The impact of SDBRE on pain and anxiety levels was not shown to be significantly correlated with medical factors including BMI, smoking status, or the number of drains. However, noteworthy results were found for a few particular variables, such as drain duration and operation type. There was a significant (p = 0.000) correlation between the kind of operation and the amount of pain experienced during chest tube removal; more complicated procedures (such CABG with numerous grafts) were linked to higher pain levels. Higher degrees of pain during removal (p = 0.01) and anxiety following removal (p = 0.007) were substantially associated with longer chest tube durations. CABG procedures, particularly those involving multiple grafts, were associated with higher pain scores, which could be due to increased surgical complexity and associated trauma. Similarly, longer drain durations (e.g., three to four days) were linked to higher pain and anxiety levels, possibly due to inflammation and the psychological anticipation of removal discomfort.

A chest tube is used to remove secretions and improve heart function during cardiac surgery. This tube is usually removed in the first 24 to 48 hours after the procedure (Ghazali et al., 2021). In this study most of patients had two to four days for chest tube before removal. Regarding to this issue, pain and anxiety had been reported among who were in longer days. This discomfort associated with CTR can produce worry and fear due to the pleura's many sensory fibers, which can result in pressure, sharpness, and burning sensations (Ülker and Ertuğ, 2012). Removing of the chest tube as soon as possible—within 24 hours of surgery is a safe and efficient way to lessen discomfort. It helps patients recover more quickly after CABG surgery and linked to a shorter hospital stay (Sadeghi et al., 2009; Zhu et al., 2023; Zurek et al., 2021).

5.6 Conclusion

The intervention group excelled the control group, as seen by the significant differences in pain and anxiety scores between the two groups. This study demonstrates how well SDBRE works to lessen anxiety and pain both during and after chest tube removal. The findings support the usefulness of relaxation techniques as a complement

approach to postoperative care. Targeted strategies taking into account the type of operation and drain duration could improve patient outcomes even while demographic and medical factors had little effect.

5.7 Strengths and Limitations of the Study

This study is considered as the first study in Palestine in studying the effect of SDBRE technique in decreasing pain and anxiety among patients whom underwent CTR post CABG. This study examined the effect of this technique on pain and anxiety, while most previous studies focused on pain only. Results may not be broadly applicable outside Nablus city due to regional specificity. Response bias may have resulted from participants giving socially acceptable answers instead of expressing their true feelings about the pain and anxiety. Both groups in the study received pharmacological interventions for pain, which may have influenced the outcomes and limited the ability to isolate the effects of the non-pharmacological interventions studied.

5.8 Recommendations

The results highlight how crucial it is to incorporate non-pharmacological treatments, such as SDBRE, into postoperative care in order to improve patient outcomes. A non-invasive, reasonably priced method of lowering pain and anxiety, SDBRE may enhance patient satisfaction and the healing process. It might be helpful to teach patients relaxation techniques, particularly those who are having complicated surgery or have greater anxiety levels. Removing the chest tube as soon as feasible is advised because it may be an effective method of reducing discomfort. Following CABG surgery, it accelerates up recovery for patients and is associated with a shorter hospital stay.

There may be variation in patient participation with the intervention, as indicated by the marginal significance of the association between anxiety and level of education.

5.8.1 Implication for Research

In order to improve patient satisfaction and quality of life, SDBRE may reduce pain and anxiety-related issues, and possible exhaustion from heart surgery. The function of customized educational interventions to maximize SDBRE efficacy may be investigated in future studies. Longitudinal studies may also evaluate the long-term

physiological and psychological advantages of relaxation methods in the healing process following surgery.

5.8.2 Implication for Practice

Using this strategy could help nurses become more aware of evidence-based practice in critical care units and improve their ability to manage pain and anxiety. In the end, this might result in better hospital practice procedures. Additionally, this method of pain treatment is straightforward for nurses to learn, economical, and time-efficient.

5.8.3 Implication for Policy Makers

In addition to pharmaceutical therapy, the current study has demonstrated that SDBRE is a safe, low-cost, time-efficient, and effective non-pharmacological method for managing pain during CTR following CABG surgery.

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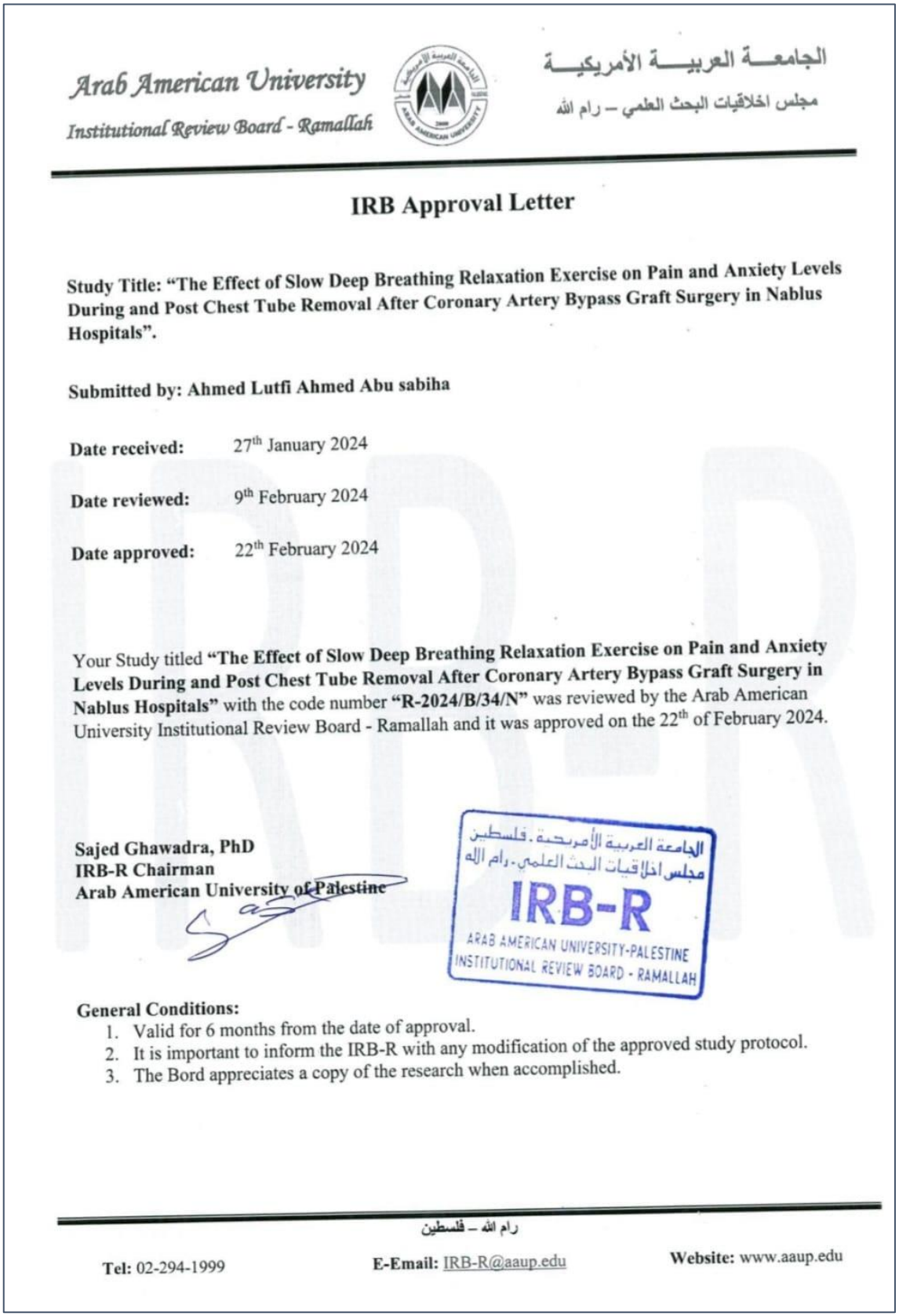
Appendices

Appendix A: IRB Approval Letter



Arab American University
Institutional Review Board - Ramallah

الجامعة العربية الأمريكية
مجلس اخلاقيات البحث العلمي – رام الله

IRB Approval Letter

Study Title: "The Effect of Slow Deep Breathing Relaxation Exercise on Pain and Anxiety Levels During and Post Chest Tube Removal After Coronary Artery Bypass Graft Surgery in Nablus Hospitals".

Submitted by: Ahmed Lutfi Ahmed Abu sabiha

Date received: 27th January 2024

Date reviewed: 9th February 2024

Date approved: 22th February 2024

Your Study titled **"The Effect of Slow Deep Breathing Relaxation Exercise on Pain and Anxiety Levels During and Post Chest Tube Removal After Coronary Artery Bypass Graft Surgery in Nablus Hospitals"** with the code number **"R-2024/B/34/N"** was reviewed by the Arab American University Institutional Review Board - Ramallah and it was approved on the 22th of February 2024.

Sajed Ghawadra, PhD
IRB-R Chairman
Arab American University of Palestine

الجامعة العربية الأمريكية . فلسطين
مجلس اخلاقيات البحث العلمي . رام الله
IRB-R
ARAB AMERICAN UNIVERSITY-PALESTINE
INSTITUTIONAL REVIEW BOARD - RAMALLAH

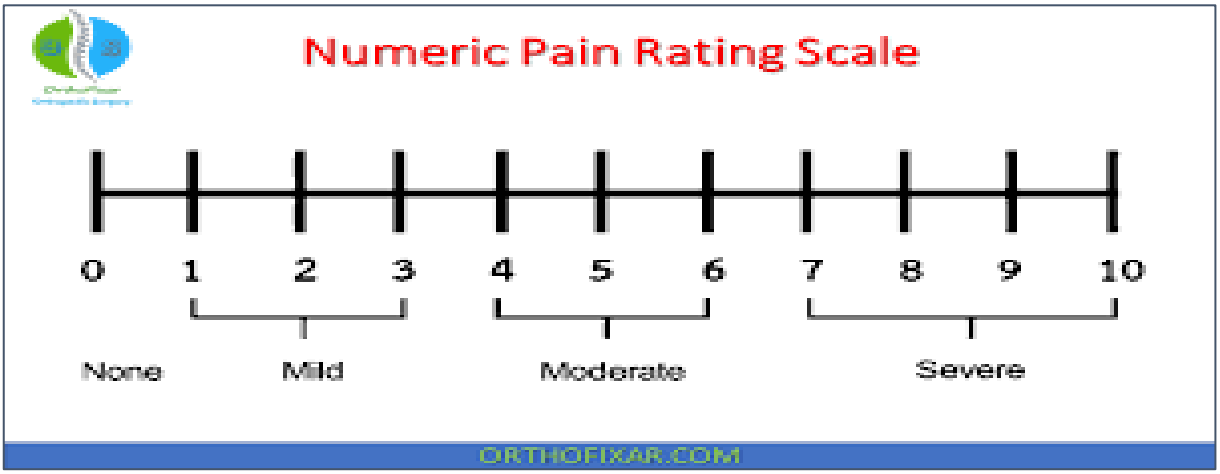
General Conditions:

1. Valid for 6 months from the date of approval.
2. It is important to inform the IRB-R with any modification of the approved study protocol.
3. The Bord appreciates a copy of the research when accomplished.

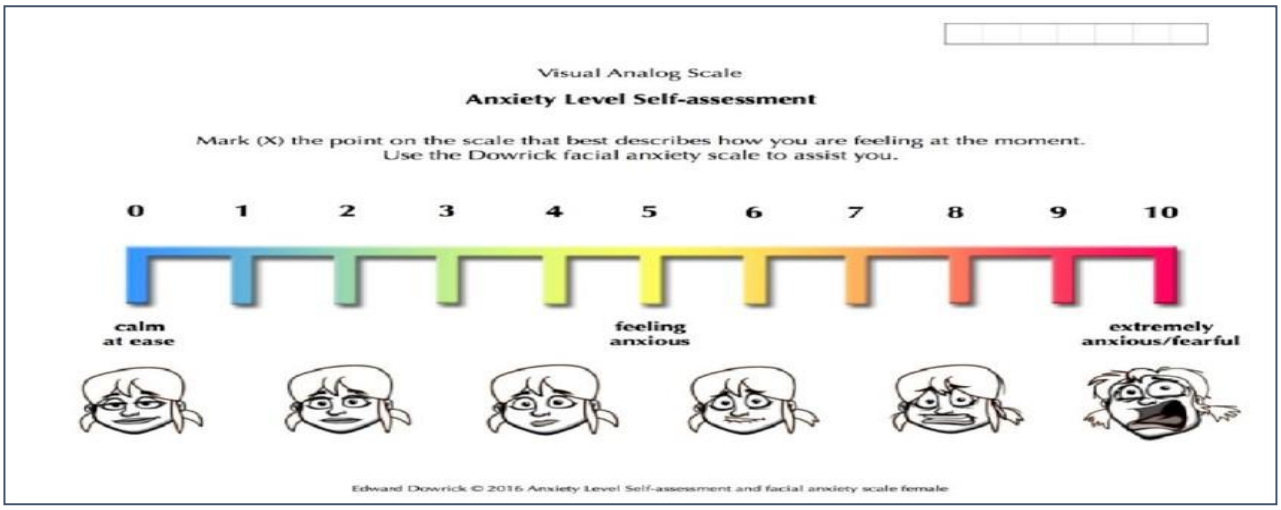
رام الله – فلسطين

Tel: 02-294-1999 **E-Email:** IRB-R@aaup.edu **Website:** www.aaup.edu

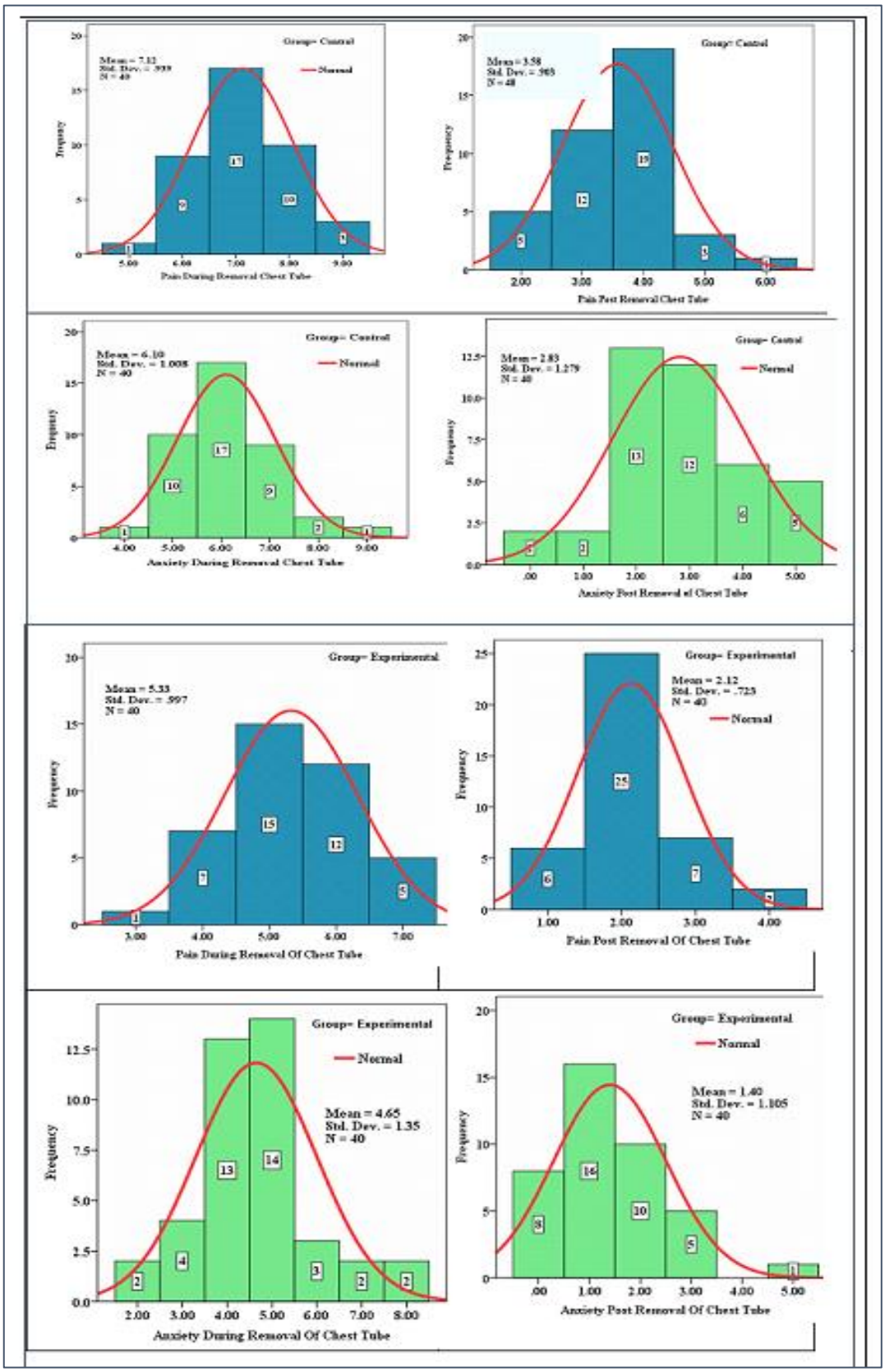
Appendix B: Numeric Pain Rating Scale



Appendix C: Anxiety Level Visual Analog Scale



Appendix D: Tests for Data Normality



تأثير تمرين الاسترخاء والتنفس العميق البطيء على مستويات الألم والقلق أثناء وبعد إزالة الأنبوب الصدري بعد جراحة مجازة الشريان التاجي في مستشفيات نابلس

احمد لطفي ابو صبيحة

د. بسمة سلامة

د. احمد العايدي

د. جمال القدومي

ملخص

الخلفية النظرية: ان إزالة أنبوب الصدر بين المرضى الذين يخضعون لإجراءات تحويل مسار الشريان التاجي هي عملية مؤلمة ومرهقة نفسيا. وهذا يؤكد مدى أهمية وضع التدابير التي تقلل من هذه الاعراض. لقد اوصى العلماء بوجود العديد من التقنيات غير الدوائية ذات الاثر الايجابي. ان لتمرين الاسترخاء والتنفس العميق البطيء الثر الايجابي على مستويات الألم والقلق أثناء وبعد إزالة الأنبوب الصدري بعد جراحة مجازة الشريان التاجي.

منهجية الدراسة: تم إجراء تصميم شبه تجريبي للمقارنة بين درجات الألم ومستويات القلق أثناء وبعد إزالة أنبوب الصدر بين مجموعتين التجريبية والضابطة. تم اختيار عينة مناسبة من مستشفيين في مدينة نابلس (العدد = 80). وبواسطة طريقة التوزيع العشوائي تم تقسيم العينة إلى المجموعة التجريبية (ن = 40) والمجموعة الضابطة (ن = 40). تم استخدام SDBRE لمجموعة التجريبية بينما تم استخدام الرعاية القياسية للضابطة. تم جمع البيانات من خلال استبيان يتكون من ثلاثة أجزاء. الجزء الأول كان حول بيانات العوامل الديموغرافية والطبية. الجزء الثاني كان لتقييم الألم أثناء وبعد إزالة أنبوب الصدر (مقياس الألم الرقمي). الجزء الثالث كان لتقييم القلق أثناء وبعد إزالة أنبوب الصدر (مقياس القلق). تم استخدام تحليل البيانات لتقييم الإحصاءات الوصفية، والاستدلالات الإحصائية، والعلاقات المتبادلة.

النتائج: كان هناك اختلافات كبيرة في درجات الألم أثناء إزالة أنبوب الصدر بين التجريبية (M = 5.325، SD = 0.997) والضابطة (P = 0.000) (M = 7.125 SD = 0.93). وكانت مجموعة التجربة على درجة أقل من الألم. كانت هناك اختلافات كبيرة في درجات الألم بعد إزالة أنبوب الصدر بين التجريبية (M = 2.125، SD = 0.723) والضابطة (M = 3.575 SD=0.903), (P = 0.000). وكانت مجموعة التدخل على درجة أقل من الألم. كانت هناك اختلافات كبيرة في درجات القلق خلال إزالة أنبوب الصدر بين التجريبية (M = 4.650، SD =

1.350) الضابطة (M = 6.100، SD = 1.008) (P = 0.000). حصلت مجموعة التجربة على درجة أقل من القلق. كانت هناك اختلافات كبيرة في درجات القلق بعد إزالة أنبوب الصدر بين التجريبية (M = 1.400، SD = 1.105) والسيطرة (M = 2.825، SD = 1.279) (P = 0.000). حصلت مجموعة التجربة على درجة أقل من القلق. لم ترتبط تأثيرات SDBRE على مستويات الألم والقلق بشكل كبير بالخصائص الديمغرافية والطبية بما في ذلك مؤشر كتلة الجسم أو حالة التدخين أو عدد انبوبات الصدر. كان بين نوع العملية التي تم إجراؤها ودرجة الألم خلال إزالة أنبوب الصدر علاقة كبيرة (P = 0.000)، (مثل تحويل مسار الشريان التاجي المتعددة المسار التحويلي). وارتبطت درجات الألم الأعلى أثناء الإزالة (P = 0.01) والقلق بعد الإزالة (P = 0.007) بشكل ملحوظ مع مدة مكوث أنبوب الصدر الكثر زمنا.

الخلاصة: تفوقت المجموعة التجريبية على المجموعة الضابطة، كما يتضح من وجود اختلافات كبيرة في درجات الألم والقلق. توضح هذه الدراسة فعالية SDBRE في تقليل القلق والألم أثناء وبعد إزالة أنبوب الصدر. تدعم النتائج فائدة تقنيات الاسترخاء كنهج مكمل للرعاية بعد العملية الجراحية. إن تنفيذ الاستراتيجيات المستهدفة التي تأخذ في الاعتبار نوع العملية ومدة مكوث انبوبة الصدر يمكن أن يحسن نتائج المرضى.

الكلمات المفتاحية: CABG، الألم، القلق، مستشفيات نابلس