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Efficacy of Early Functional Ambulation and Inspiratory Muscle Training for the Management of Abdominal Surgery Patient

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DECLARATION

This work has not previously been accepted in substance for any degree and isn't concurrently submitted in candidature for any degree. This dissertation is being submitted in partial fulfillment of the requirements for the degree of B.Sc. in Physiotherapy.

I confirm that if anything is identified in my work that I have done plagiarism or any form of cheating that will directly awarded me fail and I am subject to disciplinary actions of authority. I confirm that the electronic copy is identical to the bound copy of the thesis.

In case of dissemination the finding of this project for future publication, research supervisor will highly concern, it will be duly acknowledged as graduate thesis and consent will take from the physiotherapy department of Saic College of Medical Science and Technology (SCMST).

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Acronyms

BMI: Body Mass Index

CPAP: Continuous Positive Airway Pressure

ERAS: Enhanced Recovery After Surgery

FEV1: Forced Expiratory Volume in 1 Second

FIM: Functional Independence Measure

FVC: Forced Vital Capacity

HR: Heart Rate

IMT: Inspiratory Muscle Training

IS: Incentive Spirometer

MAS: Major Abdominal Surgery

PEP: Positive Expiratory Pressure

PPCs: Postoperative Pulmonary Complications

RR: Respiratory Rate

SpO2: Peripheral Capillary Oxygen Saturation

WHO: World Health Organization

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ABSTRACT

Background: Abdominal surgery is often associated with impaired pulmonary function, restricted mobility, and increased risk of postoperative complications. These factors delay recovery, prolong hospital stay, and negatively affect quality of life. Early functional ambulation and Inspiratory Muscle Training (IMT) have been proposed as physiotherapeutic strategies to improve recovery, yet evidence within the local clinical context remains limited.

Objective: To evaluate the efficacy of early ambulation combined with IMT in improving postoperative outcomes among abdominal surgery patients.

Methods: A quasi-experimental study was conducted at BRB Hospital, Dhaka, involving postoperative abdominal surgery patients. Participants received a structured program of early ambulation and IMT, and outcomes were measured pre- and post-intervention. Functional status, respiratory rate, oxygen saturation, and heart rate were recorded, alongside length of hospital stay. Statistical analyses compared baseline and follow-up measures to determine intervention effects.

Results: The intervention led to significant improvements in functional status and oxygen saturation levels. Respiratory parameters, including rate and heart rate, showed favorable trends post-intervention. Patients who received early ambulation with IMT demonstrated enhanced recovery profiles and reduced symptom severity compared to baseline. However, while improvements in pulmonary and functional outcomes were evident, changes in length of hospital stay were not statistically significant.

Conclusion: Early functional ambulation combined with Inspiratory Muscle Training is effective in improving respiratory outcomes, functional recovery, and oxygenation in abdominal surgery patients. Although no significant reduction in hospital stay was observed, the interventions proved beneficial for postoperative rehabilitation and can be feasibly integrated into physiotherapy protocols. Further research with larger sample sizes is recommended to consolidate these findings.

Keywords: *Early Ambulation, Inspiratory Muscle Training, Abdominal Surgery, Physiotherapy, Postoperative Recovery*

CHAPTER – I INTRODUCTION

1.1 Background

Abdominal surgery involves making an incision in abdominal area to carry out medical procedures with organs like the stomach, liver, intestines, gallbladder, pancreas, spleen, or appendix. Due to issues like infections, pain, blockages, or tumors abdominal surgeries are done. When the surgery is done in the area of umbilicus, right and left hypochondrium, epigastrium it’s called upper abdominal surgery (ManiArasi et al. 2022, p.26).

Diseases in the abdomen are usually treated based on the specific organ or condition involved (eg. appendicitis). Organs such as liver, kidneys, and stomach etc which are located in the abdominal area, are operated on according to the type of problem. Abdominal conditions are often named after the disease itself, such as appendicitis and the surgery to remove an inflamed appendix is called an appendectomy which is the most common abdominal surgeries. A technique known as an exploratory laparotomy is performed when medical professionals open the abdomen to look for damage, bleeding, or illness. When a laparoscopy is performed, thin tubes are inserted through tiny abdominal incisions, resulting in a minimally invasive procedure (Ten Broek et al. 2013, p. 347).

The United States has nearly 4 million yearly abdominal surgeries (Owings 2013, p. 41), Postoperative pulmonary problems are more common in patients after abdominal surgery (Brooks-Brunn 2015, p. 94). Postoperative pulmonary complications lead to more hospital costs, longer stays in the hospital, and increased morbidity (Lawrence et al. 2015, p. 671). The study abdominal surgery is performed yearly in 192 the World Health organization member states worldwide all 56, (29%) of all. Surgery will have an increased role in public health due to this epidemiological adjustment (Weiser et al.2013, p. 139)

Abdominal surgery has effects on post-operative lung function, as seen by decreased lung volume, including tidal volume, vital capacity, and total lung capacity. Several factors can cause these changes, including the type of anesthesia, medications used, the length of the surgery procedure, the location of the incision, staying in bed for a long time, use of muscle relaxants, and swelling in the abdomen these factors can lead to changes in normal body functions (Kalil-Filho et al. 2019, p. e1439).

Pneumonia, Acute Respiratory Distress Syndrome (ARDS), and aspiration pneumonia, collectively referred to as postoperative pulmonary complications (PPCs) remain a significant contributor to postoperative mortality accounting for approximately one quarter of all deaths in the first 6 days postoperatively (Brooks-Brunn, 2015, p. 96). Major abdominal surgery(MAS) is defined as a surgical procedure over the abdomen or upper abdomen (from costal margin to umbilicus) with 3 hours or more of operative duration.Open abdominal surgery is linked to a decline in intraoperative pulmonary function and limits the ability to facilitate effective deep inhalation and productive coughing. Both the surgical procedure and the consequent limitations increase the likelihood of experiencing postoperative pulmonary complications such as atelectasis and pneumonia (Silva et al. 2013, p. 187).

The incidence of PPCs has been reported between 10% and 88%, meaning that incidence values differ wide according to the study population and the definition used. PPCs (Arozullah et al. 2014, p. 242) Patients often developed a restrictive respiratory deficit after open upper abdominal surgery (UAS), which was described as a major decline in vital capacity (50–60%) and a moderately diminished functional residual capacity (20%) (Christensen et al. 2015, p. 94). General anesthesia and surgery directly affect the respiratory system. Both the tidal, vital, and total lung volume are affected by the surgery. This gives rise to changed pulmonary function postoperatively. It also reduces the efficacy of coughing for one week and decreases arterial air pressure and oxyhemoglobin saturation (Miller et al. 2014, p. 1). Following significant surgical procedures, vital capacity decreases to between 50% and 60%, and functional residual capacity can drop to around 30% for several days to weeks (Saad et al., 2016, p. 108).

It is commonly acknowledged that the FRC drops post-operatively and that the magnitude of this change will differ according to the surgical procedure (Wahba 2014, p. 348). Due to this impact, the FRC may drop below the closing volume, which could result in arterial hypoxemia and dependent small airway closure. Showed the advantages of PCAP following upper abdominal surgery (Denehy et al. 2016, p. 236).

Inspiratory Muscle Training (IMT) utilizes a threshold resistance during inspiration to isolate and train the diaphragm and accessory inspiratory muscles and has been shown to improve maximal inspiratory pressure, as well as diaphragmatic function (Cordeiro et al. 2023, p. 162).

A randomized controlled trial demonstrated that IMT initiated three weeks before and continued four weeks after upper abdominal surgery at an initial intensity of 50% maximal inspiratory pressure (and with weekly progression of 5–10%) demonstrated significantly decreased postoperative pulmonary complications as well as increasing inspiratory muscle strength and diaphragmatic excursions (Huang et al. 2022, p. 2222).

A systematic review of randomised controlled trials revealed that the application of IMT for more than two weeks before abdominal surgery with a duration of at least 15 min was successful in reducing postoperative pulmonary complications and increasing respiratory muscle strength (Amaravadi et al. 2022, p. 270).

We have found that early ambulation is critical in reducing hospital stay in these patients in disuse disease in ICU. However, the optimal time for postoperative mobilization in ICU patients has not been clearly studied. Abdominal surgery is more common in elderly patients and they may receive postoperative intensive care service after abdominal surgery. Criteria for early ambulation in the ICU after abdominal surgery are missing. This is interpreted by a later start for walking because of non-demanding postoperative vital signs. This could result in longer hospitalization. Association of the length of stay and walking time after an abdominal surgery in a critical care patient may help to determine the appropriate timing for commencing of ambulation in this exact group. This could mean shorter hospitalizations (Amari et al. 2023, p. 1615).

Early mobilization and walking in reducing postoperative complications have been emphasized in ERAS (Enhanced Recovery After Surgery). Post-operation, high levels of pain and anxiety are associated with reduced physical activity after major abdominal surgery. Non-pharmacological and pharmacological measures are also applied in order to lower postoperative pain. These methods incorporate rolling in bed, arm and leg exercise. Nonequilibrium physical activities rather than extensive standing, and they are better than body-strengthening, muscle-strengthening, gastrocnemius-strengthening, and muscle-balance types (e.g., turning and turning in bed) of exercise that are required to retain muscle strength and muscle and gastrocnemius balance. Some of the bed exercises to refer to are turning in the bed, hand and leg exercises, walking from right to left, bringing the heel and foot up and down, stretching the arm and leg, bringing both legs together, pedaling movement of both legs, turning the arms over, and reversing the movement of the arms and legs (Simsek Yaban et al. 2024, p. e14406).

Considering postoperative ambulation methods such as getting out of bed to ambulate, avoiding coughing, praying, sneezing, and breathing can only make you take postoperative posture early. The program of Thai traditional music is listened to, which increases early ambulation and may decrease postoperative pain to some extent. Thus, to optimize the efficacy of pain control and improve early ambulation after open abdominal surgery, traditional Thai music should be provided as an alternative method to manage postoperative pain by nurses. This would also enhance the quality of postoperative pain control (Phosida 2016, p. 284).

1.2 Rational:

Abdominal surgery significantly impacts a patient's physical function and respiratory status due to factors such as post-operative pain, restricted mobility, anesthesia effects, and bed rest. These complications frequently cause delayed recovery, heightened susceptibility to pulmonary complications, prolonged hospital stay and reduced quality of life. Classical postoperative programs often do not include early mobilization programs as well as specific respiratory rehabilitation guidelines, which play a key role in the improvement of functional recovery in such patients. Early ambulation, which is safe using the apelap technique, has also been reported to influence blood circulation, reduce occurrence of deep vein thrombosis, prevent bowel stasis and improve overall physical function. Concurrently, Inspiratory Muscle Training (IMT) focuses on respiratory muscle strengthening; it aids in the rehabilitation of pulmonary function and oxygenation, while diminishing the possibility of a postoperative pulmonary complication such as atelectasis or pneumonia. However, although the described interventions may have potential advantages the combined effects of early ambulation and IMT on abdominal surgery patients treatment outcomes in the local context are not yet clinically proven. Learning how these strategies play out in practice may provide important input as to their efficacy and hospital implementation into real life settings. The findings could support physiotherapists and clinicians in formulating evidence-based post-operative rehabilitation protocols that are both practical and effective. Therefore, this study aims to assess the functional and respiratory outcomes of patients receiving early ambulation and inspiratory muscle training following abdominal surgery, with the goal of contributing to improved post-operative care and patient recovery.

1.3 Research Question

What is the efficacy of early ambulation and inspiratory muscle training in improving post-operative recovery after abdominal surgery?

1.4 Aim of the study:

The aim of the study was to investigate the effectiveness of early functional ambulation and inspiratory muscle training for the management of abdominal surgery patient.

1.5 Objective

1.5.1: General objective:

- To investigate the efficacy of early ambulation and inspiratory muscle training in patients after abdominal surgery.

1.5.2: Specific objective:

- To identify the socio-demographic characteristics of a patient after abdominal surgery
- To find out the clinical characteristics of patients undergone abdominal surgery
- To investigate the cardiorespiratory function before and after intervention.
- To observe the oxygen saturation level before and after intervention.
- To identify the functional status before and after intervention.
- To calculate the length of hospital, stay from the patient's medical records.

1.6 Research Hypothesis:

Null Hypothesis (Ho):

Early ambulation and inspiratory muscle training do not have a significant effect on recovery outcomes in patients following abdominal surgery.

$$\mu_1 - \mu_2 = 0 \text{ or } \mu_1 \neq \mu_2$$

Alternative Hypothesis (Ha):

Early ambulation and inspiratory muscle training have a significant positive effect on recovery outcomes in patients following abdominal surgery

$$\mu_1 - \mu_2 \neq 0 \text{ or } \mu_1 \neq \mu_2$$

Where:

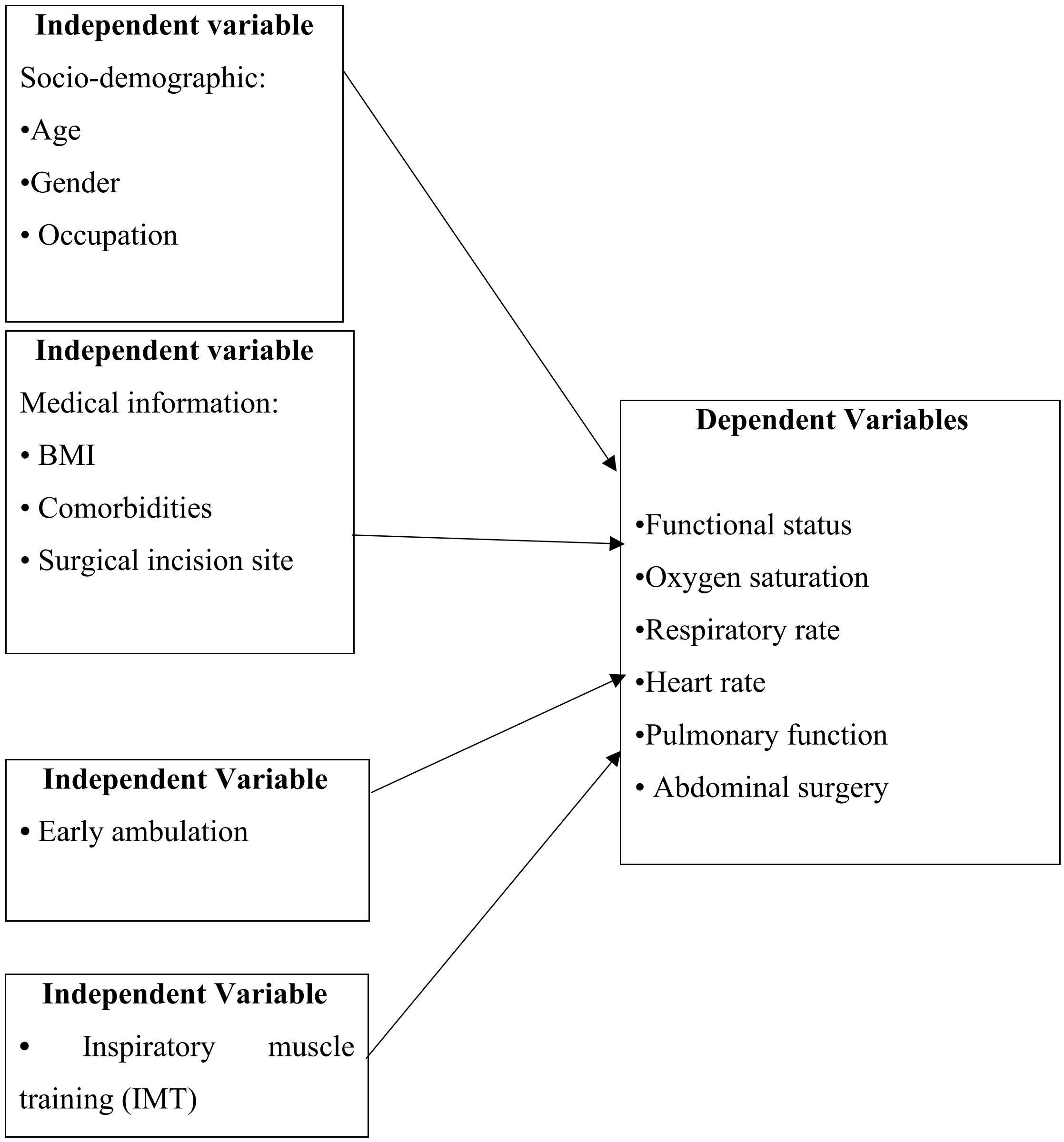
H_0 = Null Hypothesis

H_a = Alternative Hypothesis

μ_1 = Mean difference in the initial assessment

μ_2 = Mean difference in the final assessment

1.7 Conceptual Framework:



1.8 Operational Definition:

Abdominal Surgery:

A medical procedure involving surgical intervention within the abdominal cavity to treat conditions affecting organs such as the liver, stomach, intestines, pancreas, and gallbladder called abdominal surgery. This can include either traditional open surgery or minimally invasive laparoscopic techniques. The surgery aims to treat various issues such as infections, obstructions, tumors or other pathological conditions. Postoperative care focuses on early mobilization, effective pain management, and prevention of complications such as deep vein thrombosis and infections.

Early Ambulation:

Early ambulation is the initiation of walking and other form of movement within 1 or 2 days after abdominal surgery. This early movement helps to improve blood flow, reduces the risk of complications such as blood clots, lung infections, and muscle weakness, and supports faster recovery. Healthcare professionals usually supervise and guide to provide patient safety and encourage progressive mobility according to patient tolerance

Inspiratory muscle training:

Inspiratory Muscle Training refers to a structured program of resistance-based breathing exercises specifically designed to strengthen the diaphragm and other muscles involved in inhalation. It helps to improve pulmonary function, reduce post-operative respiratory complications and enhance overall respiratory efficiency of abdominal surgery patients.

CHAPTER – II	LITERATURE REVIEW

2.1 Structure of Abdomen

The complex nature of the abdominal wall negatively impacts a patient's quality of life. Most of the anterolateral abdominal wall is formed by four paired, symmetrical muscles. It may be noted that the superficial to deep layers of the anterolateral abdominal wall are considered distinct layers so far (WallSeeras and Prakash 2018, p. 348).

The anterolateral abdominal muscles are primarily responsible for three functions: tensioning the abdominal wall, moving the trunk, and stabilizing the spine. The functions of the anterolateral wall are multifaceted and include defense of the abdominal viscera, preservation of the anatomical position, assistance with forceful expiration, and participation in any activity that increases intra-abdominal pressure (DiBello and Moore 2016, p. 464).

The abdomen, one of the main anatomical regions of the body, is quite paradoxical in terms of the accessibility to its contents, despite its anterior approach is soft and malleable when relaxed and its organs not being small. It is limited by the pelvis below and the thorax above. Normal abdominal viscera are typically not detected on physical examination, possibly except for a liver that has been pushed below the costal margin by a diaphragm or the descending aorta’s pulsations in a pathologically or constitutionally thin person, in which case the inferior margins of the kidneys and liver may also occasionally be felt (Colucci et al. 2015, p. 673).

But in the modern era of obesity a global epidemic, a distended abdomen with central adiposity may not present at the bedside with pathologically enlarged intraabdominal organs, fluid, or both. The Latin verb "Abdera," which means "to hide," is where the word "abdomen" originates. This means that internal organs including the kidneys, liver, and intestines are usually invisible. The phrase "belly," which refers to protrusion, distension, or swelling, is caustic because it derives from the Old English word "belt," which implies "a bag." The plural noun bellows and the active verb billow provide visual examples of this. The liver is percussion detectable and is technically located in the thorax, under the dome of the right hemi diaphragm. However, its anatomical and functional similarities are greater with the spleen and the organs of digestion than with the heart and lungs, for which the liver acts as a supporting structure (Reuben 2016, p. 143).

Numerous diseases that cause malfunction or disfigurement can affect any of the tissues that make up the abdominal wall, including the muscles, subcutaneous fat, skin, and fascia. Changes in multiple tissues are common. For instance, subcutaneous adipose buildup is not the only factor contributing to obesity. It often coexists with flaccidity or diastasis of the abdominal muscles. High rates of incisional hernias and delicate, unsightly scars are common in obese people who have had abdominal surgery. The dermis, adipose tissue, collagenous structure, and elastic fibers are all negatively impacted by hormonal fluctuations. Numerous pregnancies have a detrimental effect on the tissues of the abdominal wall (Pitanguy 2017, p. 99).

2.2 Abdominal surgery

Abdominal surgery includes a variety of surgical techniques, one of which is a laparotomy, or abdominal opening. However, they vary according to which part of the body is injured; for example, an aortic aneurysm would be treated by vascular surgery, a caesarean section by uterine surgery, and a cholecystectomy by upper gastrointestinal GI tract surgery (Lavelle Jones 2012, p. 99). Abdominal surgery is a recommendation for patients whose ailments impact any part of the abdominal cavity. Patients suffering appendicitis, uncertain symptoms relating to the abdominal cavity, miscarriage or fetal mortality, and unknown abdominal hemorrhage are considered prospective patients. Most individuals are seeking medical care because of particular symptoms. Constipation, diarrhea, discomfort, and any sudden changes in bowel movements are typical symptoms (McGrath and Pomerantz 2012, p. 1234).

An abdominal activity has the goal of preventing any bleeding and curing the symptoms of damage resulting from an appendix that has burst or grown inflamed, as these conditions can be painful. Verifying the underlying causes of these symptoms may also be the goal of the procedure, causing the best possible course of action to be selected (McGrath and Pomerantz 2012, p. 1236). Open incisions like laparotomy are known to cause a greater physiological stress response. The two events that are causing this stress are the initial injury from the incisions and tissue mobilization, together with the inflammatory reactions that follow (Scott and Miller 2015, p. 79) all procedures are ranked based on their level of complexity, independent of the problematic body system that is causing the problem. Whenever performing abdominal surgery, the surgeon's goal is to use the type of incision that is believed to be most suitable for that particular procedure. The incision must provide direct, easy access to the anatomy as well as sufficient room for the required surgery in order to allow for a thorough investigation of it. It should be extensible to allow for any planned expansion in the operation's scope. It would interfere with the functioning of the abdominal wall, but this interference needs to be limited. A portion of the wound from the surgical incision is associated with the morbidity of the abdominal surgery (Patnaik et al. 2015, p. 170).

Older patients account for 40% of the nearly 1 million major abdominal operations performed annually. The return to pre-operative functional independence is less well described. This work clarifies the course and predictors of function (Lawrence et al. 2014, p. 762). There has been a lot of progress in abdominal surgery during the last 20 years, which is characterized by the transition from open to minimally invasive and closed procedures. Therefore, new technologies for pain treatment were created, especially with the application of ultrasound guided abdominal wall blocks. Even though pain during laparoscopic abdominal surgery has been reported to be not significant, it can still be rather severe and requires proper treatment (Hemmerling 2018, p. 971).

2.3 Effect of Abdominal Surgery on Functional

In their study reported a marked decrease in functional performance following abdominal surgery. Immobility, shallow breathing, incision pain, duration of surgery and anesthesia, and increased risk of potential causes of this have been identified as postoperative pulmonary problems (Ajepe et al. 2016, p. 488). The ability to mobility and take care of oneself, the ability to tolerate oral intake, the absence of aberrant physical indications or laboratory tests following surgery, and sufficient pain management are all examples of functional recovery, which has also been considered as a crucial part of patients' discharge criteria. Nonetheless, poor functional recovery after surgery has been found to be a frequent source of financial and social hardship and may raise the chance of readmission to the hospital after abdominal surgery (Jeong et al. 2016, p. e3140). Bed rest represents more than 80% of the recovery time in patients admitted for emergency abdominal surgery, particularly in elderly patients leading to a rapid early loss of muscle. Muscle atrophy may impact on function to a greater extent in these individuals as they have smaller physiological reserves (McComb et al. 2018, p. 1).

2.4 Effect of Abdominal Surgery on Pulmonary Function

Pulmonary function usually alters after surgery, especially in patients who had undergone upper abdominal or chest surgical procedures. Reduction in all other pulmonary capacities systemic physiologic changes are directly related to the anesthetic type (general, regional), method of incision and surgical method performed (Sanabria et al., 2016. 2013, p. 87). There is a marked reduction in pulmonary function tests, including forced expiratory volume in one second (FEV 1) and forced vital capacity (FVC), on the first postoperative day after upper abdominal surgery. This decrease in vital and inspiratory capacity may lead to restrictive lung diseases with atelectasis, reduced diaphragm mobility and respiratory insufficiency. (Dronkers et al. 2018, p. 134). Immediately following induction, respiratory muscle function changes. Airway blockage happens, the spine becomes more curved, the cephalad diaphragm moves in dependent areas, and the chest wall's cross-sectional area shrinks (Miskovic and Lumb 2017, p. 317).

2.5 Pathophysiology of Abdominal Surgery

Postoperative pulmonary function is altered after abdominal surgery when lung capacities, such as tidal volume, vital capacity and total lung capacity are reduced. There is also a decrease in arterial pressure and oxygen saturation (Roberta et al. 2018, p. 269). Following abdominal surgery, a number of pathophysiological reactions are induced by the length of the procedure, anesthetic condition and nociception, all affecting pulmonary function (Lunardi et al. 2015, p.1003), intensify the fall in mucociliary clearance and inhibit cough reflex leading to secretion pooling and reduced lung volumes. In the end, these variables increase the possibility of infection and obstructive atelectasis (Smith and Ellis 2014, p. 69).

2.6 Abdominal Surgery with Associated Complications

The most common complication of abdominal surgery is PPCs secondary to infection. Prolonged anesthesia, emergency upper abdominal surgery, present smoking, pulmonary comorbidity, obesity, old age and multiple operations are the risk factors for PPC development (Yang et al. 2015, p. 441).

The majority of complications are pulmonary in nature, which have been defined as any abnormality involving the lungs that develops in the post-operative setting and generates illness and dysfunction leading to an adverse clinical course. Mortality and morbidity are greatly influenced by pulmonary complications after major abdominal operations. Post-operative pulmonary complications (PPCs) are reported to occur in 5 to 10% of general population and up to 4 to 22% of patients following abdominal surgery. The shallowing breathing patterns of PPCs result in inadequate lung inflation. Because prolonged recumbent posture increases the likelihood of retained lung secretions and hinders mucociliary clearance, coughing is less effective. Opioids, analgesics, residual pulmonary secretions, anesthesia, and post-operative discomfort could all be contributing factors to the altered breathing patterns (Shingavi et al. 2017, p. 374).

PPCs, or postoperative pulmonary complications, are expensive, frequent, and raise the possibility of patient death. In addition to changes to the respiratory system, PPC encompasses nearly all post-operative respiratory issues resulting from anesthesia and surgery, occur as soon as general anesthesia is given: lung volumes are reduced, respiratory muscle activity and function are altered and atelectasis occurs in up to 75% of patients receiving a neuromuscular blocking agent (Miskovic and Lumb 2017, p.F320). Cough is inefficient in patients after abdominal surgery. PCF1 had decreased to 54% of the preoperative value on the first postoperative day. PCF was still much lower at 72% than preoperative values on day postoperatively indicated that postoperative pain and restrictive lung lack of concentration is certainly thought to be potential risk factors causing coughing disorder (Smith and Ellis, 2014, p. 69). Stated later in their study that this restrictive pattern is thought to be caused by a reduction in lung capacity caused by diaphragmatic dysfunction, general anesthesia, and abdominal distention (Colucci et al. 2015, p. 674).

Pneumonia, respiratory failure, atelectasis, pleural effusion, pneumonia and bronchospasm represent postoperative pulmonary complications (PPCs), which are a common cause of morbidity after major non-cardiac surgery. In fact, they are about as common as cardiovascular disease in patients undergoing non-cardiac surgery. The operating site is one of the crucial risk factors for PPCs. The highest risk is associated with surgery involving the thoracic, upper, and particularly abdominal aortic areas. It appears that PPC development is significantly influenced by how close the skin incision is to the diaphragm. According to multiple studies, people who have upper abdominal surgery have less ventilation because their dependent lung zones enlarge as a result of a decrease in diaphragmatic motility. (Pasin et al. 2017, p. 562).

Pulmonary Complication Postoperatively postoperative pulmonary complications are most common and can be fatal, even following upper abdominal operations. Pulmonary complications after surgery are also more common if the surgical incision is near the diaphragm. As a result, there is a 2 to 8% incidence of postoperative pulmonary complications after lower abdominal surgery and the unintentional risk is even higher at close to 20% after upper abdominal surgeries. Numerous pathological reactions can arise from upper abdominal procedures, some of which may induce post-operative breathing issues in elderly individuals. The pathogenic effects include increased breathing rate, decreased lung capacities and capabilities, diaphragm flexion restriction, mucociliary dysfunction, decreased effectiveness of cough, and alterations in the ventilation-perfusion ratio. Functional dependence, smoking habits, obesity, the nutritional status and emergency surgery Whereas age is a risk factor for these complications advanced age as its effects on respiratory function and chronic obstructive lung disease Were additional variables associated with an increased Risk of Postoperative Pulmonary Complications (Sorour et al. 2019, p. 537).

Following surgical site infections, pulmonary problems are the second most frequent kind of surgical complication (Yang et al. 2015, p. 445). Pulmonary complications are ailments that affect the respiratory system and may negatively affect the patient’s clinical state after surgery. Depending on the patient’s or the surgical procedures risk variables, PPC incidence could vary from 2% to 40%. Postoperative pulmonary complications (PPC) include the following: tracheal reintubation within 48 hours, atelectasis, bronchospasm, respiratory insufficiency, pneumonia, worsening of chronic obstructive pulmonary disease (COPD), or tracheal intubation for more than 48 hours as a result of maintaining mechanical ventilation (Langeron et al. 2014, p. 480).

2.7 Role of Physiotherapy

Following open abdominal surgery, patients are treated with physiotherapy. It includes a range of treatments intended to enhance the patient's cardiovascular and/or physical health and lower the risk of pulmonary problems following surgery. Lung expansion exercises, limb extension exercises, progressive mobilization programs, and other methods are a few examples of these therapies. Studies conducted at hospitals in NSW have shown that up to 35% of patients who have open abdominal surgery develop clinically significant postoperative pulmonary problems (Mackay and Ellis 2012, p. 75).

2.8 Inspiratory Muscle Training

Inspiratory Muscle Training (IMT) is a technique that applies threshold resistance during inspiration to specifically load and strengthen the diaphragm and accessory inspiratory muscles, effectively improving maximal inspiratory pressure and diaphragmatic function (Cordeiro et al. 2023, p. 162).

A randomized controlled trial demonstrated that IMT initiated three weeks before and continued four weeks after upper abdominal surgery at an initial intensity of 50% maximal inspiratory pressure (with 5–10% weekly progression) significantly reduced postoperative pulmonary complications while enhancing inspiratory muscle strength and diaphragmatic excursion (Huang et al. 2022, p. 2222).

A systematic review Fiurther, a systematic review of randomized controlled trials found that IMT applied for at least 2 weeks before abdominal surgery lasting > 15 min decreased postoperative pulmonary complications and increased respiratory muscle strength (Amaravadi et al. 2022, p. 270)

2.9 Early ambulation

Early ambulation is particularly crucial in acute care physical therapy since it preserves these critically impaired physical functions from bed rest, and enhances them greatly. quality of life following discharge. Early ambulation decreases ICUAW symptoms and hospital complications as well as reduces problems and stays in the surgical intensive care unit. Early ambulation, that might lead to a significant reduction in hospital stay, can thus be of benefit for the disused ICUs population. There hasn't been much research done on the best time to visit ICU patients following surgery. However, more older patients are having abdominal surgery, which has resulted in more ICU admissions following the procedure (Amari et al. 2023, p. 1612).

Early ambulation is a commonly practiced and highly recommended component of postoperative care after abdominal surgery. Preventing postoperative pulmonary complications is one of the benefits, which has been confirmed in the literature; however, there is little data linking early mobilization to the length of stay after surgery. This study is designed to assess, using a clinical indicator, the effect of early mobilization on length of stay. Early ambulation provides a wonderful viewpoint and is a logical stage in the surgical process. There are clear advantages to early ambulation from an anatomical, physiological, psychological, and financial standpoint. An analysis of 6,130 cases shows that both intentional and involuntary coughing, as well as early ambulation, have been shown to minimize respiratory and circulatory problems. Early ambulation has been encouraged by the current hospital bed crisis, growing economic dislocation (negative variables), increased healing quality and rate, lack of post-operative problems, and elimination of hospital costs (positive ones) (Jain and Tiwari 2021, p. 354).

A series of guidelines known as Enhanced Recovery After Surgery (ERAS) was created to inform patients about the postoperative care of abdominal procedures. It reduces hospital expenses and postoperative difficulties, as well as the length of hospital stay and early discharge, lessens organ dysfunction, minimizes pain to enhance patient comfort, and supports an early return to daily activities, all of which provide a quicker recovery (Hubner et al. 2015, p. 45). Early ambulation and rehabilitation after severe sickness and elective abdominal surgery have been extensively studied. Numerous credible studies are beginning to support the idea that critically ill patients can benefit from up to 15–30 minutes of physical activity each day without risk (Perme and Chandrashekar, 2019, p. 212).

CHAPTER – III	METHODOLOGY

3.1 Study Design

This research follows a quasi-experimental design to evaluate the efficacy of early ambulation and inspiratory muscle training for the management of abdominal surgery patient. The study compares pre- and post-intervention outcomes in participants who receive the exercise intervention over a defined period.

3.2 Study Area

The study will be conducted in the postoperative recovery unit of surgical department of BRB Hospital Limited, 77/A Panthapath, Dhaka-1215, where patients recovering from abdominal surgery received postoperative care.

3.3 Study Place

The present study was conducted at Saic College of Medical Science and Technology, Mirpur 14, Dhaka 1216.

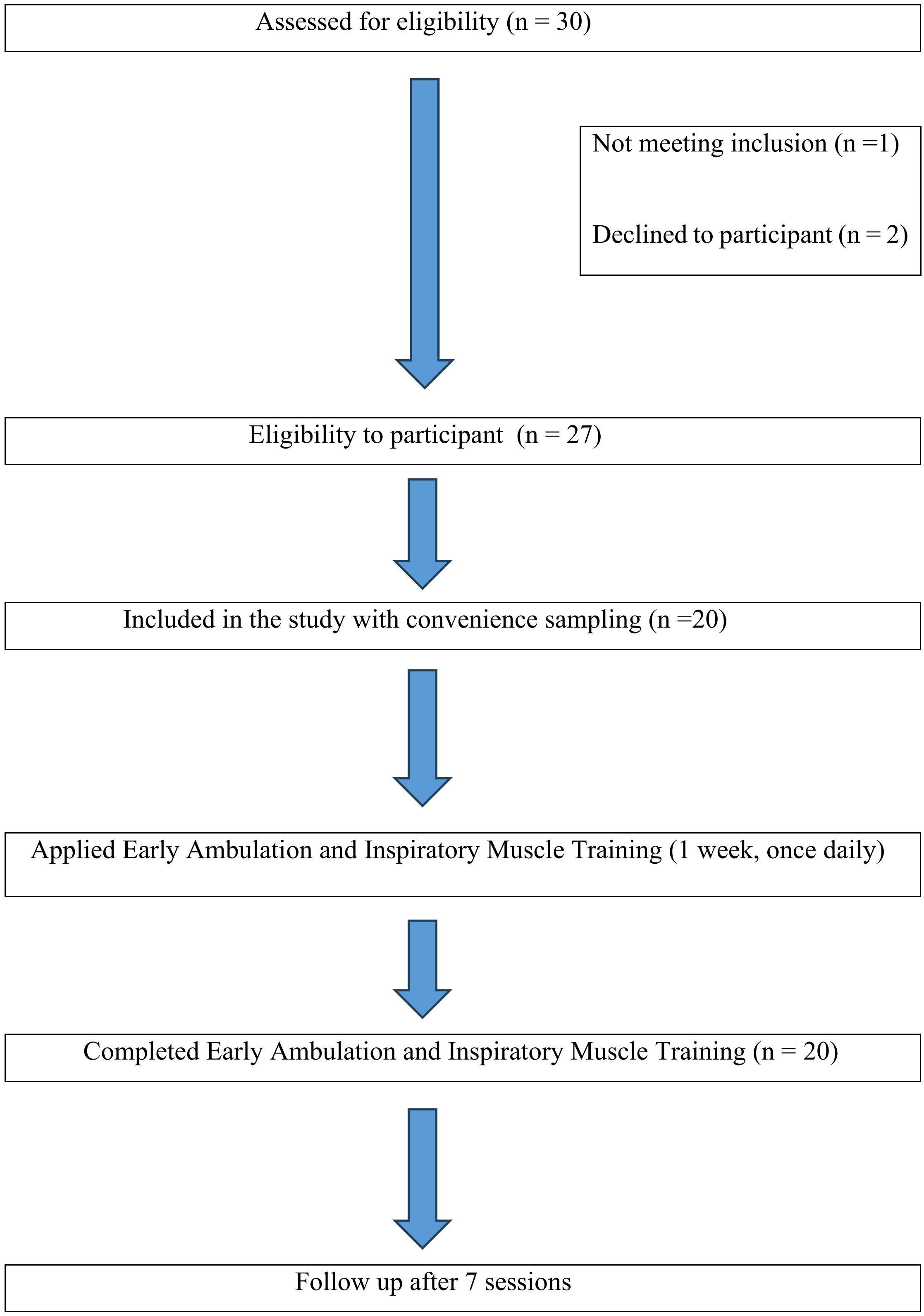
3.4 Study period

The data has been collected from June 2024 to July 2025

3.5 Study Population

The study population were the after abdominal surgery patients being treated at BRB Hospital Limited, 77/A Panthapath, Dhaka-1215 during the study period.

3.6 Flow Chart of Phages of Pre-test and Post-test design



3.7 Sample selection

Participant were selected based on inclusion criteria relevant to the study's objectives. A total of 20 participant who met these criteria were included in the study.

3.8 Sampling Technique

I use a convenience sampling techniques to select sample unit for this study.

3.9 Eligibility Criteria

3.9.1 Inclusion Criteria

- Patients who have undergone abdominal surgery.
- Both male and female.
- Age between 15 to 85.

3.9.2 Exclusion Criteria

1. Any musculoskeletal or neurological disorder affecting exercise performance.
2. Patients with unstable vital signs or requiring intensive care support.
3. Mentally unstable patients.
4. History of chronic respiratory disease (e.g., COPD) affecting baseline pulmonary function.
5. Patients who are not interested.

3.10 Method of data collection:

3.10.1 Techniques of data collection:

- Face to face interview and assessment of patient.
- Review patients records.

3.10.2 Data collection instrument:

Questionnaire:

The researcher developed a structured self-made questionnaire with the guidance and approval of the supervisor, adhering to standard rules of question construction. The questionnaire on socio-demographic characteristic (name, age, education level, marital status, profession, and address…. etc), medical questions (Height, Weight, BMI, …. volume in 1 second, respiratory rate…etc), (physical activities (Functional Independence Measurement (FIM) scale) and length of hospital stay. A questionnaire developed by the researcher was utilized to collect data from pre-test, treatment and post test.

3.10.3 Measurement Tool

1.FVC (Forced Vital Capacity)

FVC is the maximum amount of air a patient can blow out after taking a deep breath. After abdominal surgery, patients often cannot breathe deeply because of pain and weak muscles. This makes their lungs work less efficiently. By measuring FVC before and after the treatment, we can see whether early walking and breathing exercises improve lung strength and capacity. If FVC improves, it means the lungs are working better.

2.Forced Expiratory Volume in One Second (FEV1)

FEV1 shows how much air a person can blow out in the very first second of a forced breath. When FEV1 is low, it means the airways are not clearing properly and breathing is weak. Walking and inspiratory muscle training help strengthen the breathing muscles and open the airways, improve the airway condition. If FEV1 improves after these treatments, it means the patient's breathing efficiency and airway clearance are getting better.

3. Respiratory Rate (RR)

Respiratory rate means the number of breaths a person takes in one minute. After surgery, patients usually take fast and shallow breaths because of pain. This is not good for lung health. Early walking encourages deeper breathing, and breathing exercises help control and slow down the breath. By checking respiratory rate, we can see if the treatments are helping patients breathe more normally and comfortably.

4. Heart Rate (HR)

Heart rate is the number of times the heart beats in a minute. After surgery, staying in bed for too long makes the heart and circulation weaker. Walking early helps improve blood circulation, and breathing training reduces extra stress on the heart. Monitoring heart rate will show whether patients are improving their stamina and recovering safely

5. Functional Independency Measure (FIM) Score

About the FIM The Functional Independence Measure (FIM) measures a patient's level of disability, consistent with the American Medical Association Guides to the Evaluation of Permanent Impairment. The scoring is based on the assessment on how an individual can function in activities of daily living. Higher FIM values are indicative of more independence and functional improvement, while lower values represent increasing dependency.

(Functional Independence Measurement (FIM) Scale)

Levels	**Independent**	
7	Complete Independence (Timely, safely)	NO HELPER
6	Modified Independence (Device)	
	Modified Dependence	HELPER
5	Supervision (Subject = 100% +)	
4	Minimal Assist (Subject = 75 % +)	
3	Moderate Assist (Subject = 50% +)	
2	Maximal Assist (Subject = 25%+)	HELPER
1	Total Assist (Subject = Less than 25%+)	

3.11 Data collection procedure:

1. **Baseline Assessment (Pre-Test):**
   Prior to the intervention, each participant underwent a baseline assessment record initial values for FVC, FEV1, Respiratory rate, Heart rate and FIM score.

2. **Intervention Phase:**
   Participants received standard intervention comprising Early ambulation and Inspiratory muscle training under the supervision of a qualified therapist. Each session was initiated within 24 hours post-surgery, carried out 25-35 minutes per session, administered once daily. The intervention continued for 1 week.

3. **Post-Intervention Assessment (Post-Test):**
   After completing the intervention, post test assessment was conducted to record changes in the same parameters as measured in the pre-test

4. **Data recording and Confidentiality:**
   All data will be coded to maintain confidentiality. Collected data will be stored securely in both digital and hard-copy formats, accessible only to the research

3.12 Intervention Protocol

Participants will undergo a 1 week structured physiotherapy program focusing :

- **Early Functional Ambulation:** Initiated within 24-48 hours post-surgery (as tolerated), including supervised bedside mobility, sitting, standing, and hallway walking.
- **Inspiratory Muscle Training (IMT):** Using a threshold device or incentive spirometer, patients will perform inspiratory exercises twice daily, progressively increasing resistance as tolerated.

Early Ambulation treatment protocol:

1 week Treatment Protocol for Early Ambulation

Total session: 7 (1 session per day).

Session Duration: 15-20 minutes.

1.Supine to Side Lying

Staring Position: Patient lies flat on their back(supine) with arms relaxed.

Duration: 3-5 minutes.

Instructions:

- Ask the patient to bend their knees slightly to reduce abdominal strain.

  Encourage turning of the head and shoulders to the rolling side.

- Assist the patient to bend the opposite knee and reach across using the opposite arm.

- Support the abdomen with a pillow if needed.

2. Side Lying to Sitting

Starting Position: Patient lies on their side.
Duration: 3–5 minutes

Instructions:

- Ask the patient to push up with the upper arm while lowering their legs off the bed.
- Support the trunk and guide the patient while upright sitting position.
- Ensure the patient keeps the abdomen supported to avoid strain.
- Allow the patient to maintain sitting balance for a few breaths before progressing.

3.Sitting to Standing

Starting Position: Patient sits at the edge of the bed with feet placed flat on the ground.

Duration: 4–5 minutes

Istructions

- Encourage the patient to lean slightly forward before attempting to stand.
- Provide assistance by supporting the arms or using a walking aid if necessary.
- Ask the patient to press down through their legs to rise into standing.
- Maintain abdominal support with a pillow or binder if required.

4.Walking

Starting Position: Patient stands with support.

Duration: 5–10 minutes

Instructions:

- Encourage the patient to begin with short steps while holding support or using a walker.
- Gradually increase the walking distance each day according to tolerance.
- Monitor heart rate, breathing, and signs of fatigue.
- Provide rest breaks if the patient feels discomfort.

Early Ambulation Treatment Protocol:

Treatment name	**Duration**	**Per session duration**	**Total session**
1. Supine ↔ Side Lying	3–5 minutes	15–25 minutes	7 (1 session per day)
2. Side Lying ↔ Sitting	3–5 minutes	15–25 minutes	7 (1 session per day)
3. Sitting ↔ Standing	4–5 minutes	15–25 minutes	7 (1 session per day)
4. Walking	5–10 minutes	15–25 minutes	7 (1 session per day)

Inspiratory Muscle Training (IMT) Treatment Protocol:

1-Week Treatment Protocol for Inspiratory Muscle Training

1.Upright Sitting Position

Starting Position: Patient will sits upright on a chair or bed with the back supported. A nose clip may be used to prevent nasal breathing.

Duration: 2–3 minutes.

Instructions:

- Ensure the patient is relaxed and comfortable.
- Encourage normal breathing for a few minutes to prepare the respiratory system.
- Provide abdominal support with a pillow to reduce surgical discomfort.

1. **Warm-Up Breathing**

Duration: 2–3 minutes

Instructions:

- Ask the patient to take slow, deep breaths in through the mouthpiece and exhale normally.
- Focus on diaphragmatic breathing, encouraging expansion of the abdomen.
- This step prepares the inspiratory muscles for resisted breathing.

3. IMT with Resistance

Duration: 8–10 minutes

Instructions:

- Attach the inspiratory muscle training device (e.g., Threshold IMT).
- Begin with 30% of the patient's maximum inspiratory pressure (MIP)
- Patient inhales forcefully against the resistance, then exhales normally.
- Perform 3 sets of 10–15 breaths, with 1–2 minutes rest between sets.
- Increase resistance gradually (by about 5%) every 2–3 days if tolerated.

Safety:

- Monitor for dizziness, fatigue, or excessive breathlessness.
- Allow rest if needed.

4. Cool-Down Breathing

Duration: 2–3 minutes

Instructions:

- After resistance training, encourage slow and gentle breathing without resistance.
- Focus on relaxation and gradual return to normal breathing.
- Helps reduce fatigue and stabilize breathing pattern post-exercise.

Inspiratory Muscle Training (IMT) Treatment Protocol Table:

Treatment name	Duration	Per session duration	Total session
1. Upright sitting position	2–3 minutes	15–20 minutes	7 (1 session per day)
2. Warm-up breathing	2–3 minutes	15–20 minutes	7 (1 session per day)
3. IMT with resistance	8–10 minutes	15–20 minutes	7 (1 session per day)
4. Cool-down breathing	2–3 minutes	15–20 minutes	7 (1 session per day)

3.13 Data Analysis:

The data was analyzed using SPSS (25) and MS Excel. The pretest and posttest data for FVC, FEV1, respiratory rate, heart rate, and FIM score were analyzed using descriptive statistics. Due to absence of a control group and being the within-subject measure, Wilcoxon Signed-Rank was used to compare pre- and post-treatment.

3.14 Statistical Significance

A p-value of <0.05 was considered statistically significant. This confirmed that the changes observed after early ambulation and inspiratory muscle training were not likely due to chance.

3.15 Informed Consent

Informed consent was achieved with all the respondents before they filled the questionnaire in written form. The researcher made known to the participants their part in this study. All subjects provided written informed consent to participate in the study.

Subjects were instructed in a simple and practical way of the purpose, procedure, and effects of early ambulation and inspiratory muscle training. Participation was completely voluntary and patients were informed of their option to withdraw from the study any time without influencing current medical service. Written consent was obtained either by signature or thumb impression in the presence of a witness. Participants were also reassured about safety measures during the intervention, such as abdominal support during mobility and breathing exercises, to minimize discomfort. Confidentiality of all personal and medical information was strictly maintained.

3.16 Ethical Consideration

ERB/3 152 22 of SAIC College of Medical Science and Technology (SCMST) reviewed and approved the research proposal. The research protocol followed the recommendation of Bangladesh Medical Research Council (BMRC) and World Health Organization (WHO). Prior to data collection, the purpose and objectives of the study were explained in detail to each participant, verbally obtaining their informed consent. Participants were informed that they had the right to stop participating at any time without experiencing disadvantages. During the study, the researcher has maintained confidentiality of participant names, addresses and any other personal information.

CHAPTER – IV RESULTS

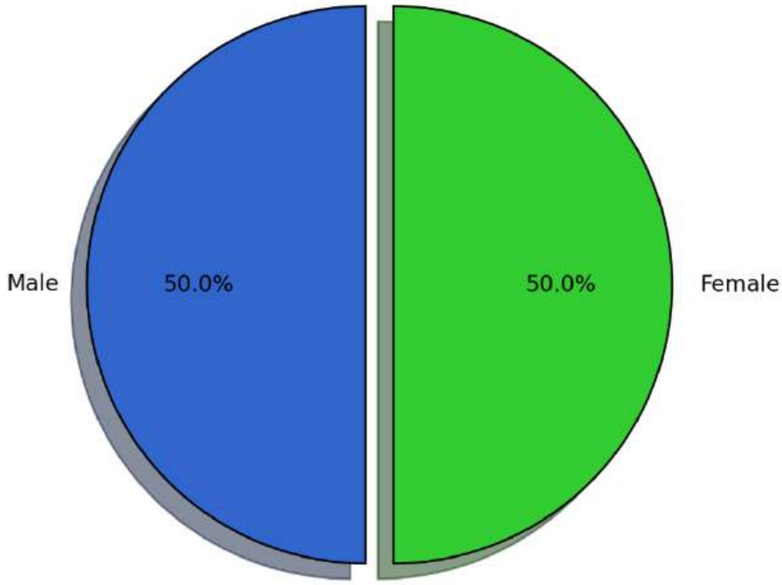
4.1 Sociodemographic Characteristics:

Table No. 1: Age of the participants

Age category in years	Frequency (N)	Percentage (%)
15–34	6	30%
35–54	7	35%
55–74	5	25%
75–84	2	10%
Total	20	100%
Mean ± SD	45.25 ± 18.69	

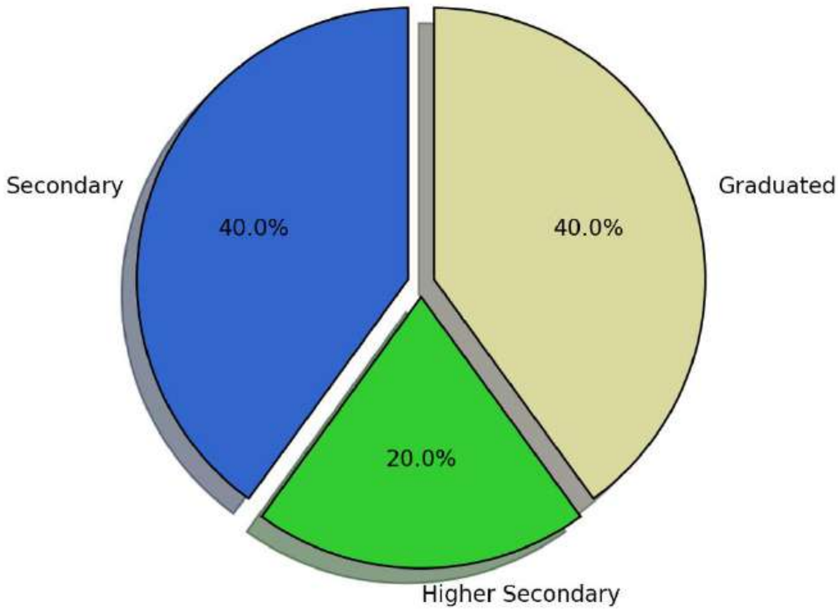
The study included 20 participants divided into four age categories. The largest group was 35–54 years, with 7 participants (35%), followed by the 15–34 years group with 6 participants (30%). The 55–74 years group made up 5 participants (25%), while the smallest group was 75–84 years with 2 participants (10%). The average age was 45.25 years (±18.69), which shows that the sample covered both younger and older adults, but most participants were in middle age.

4.1.1 Gender of the participant



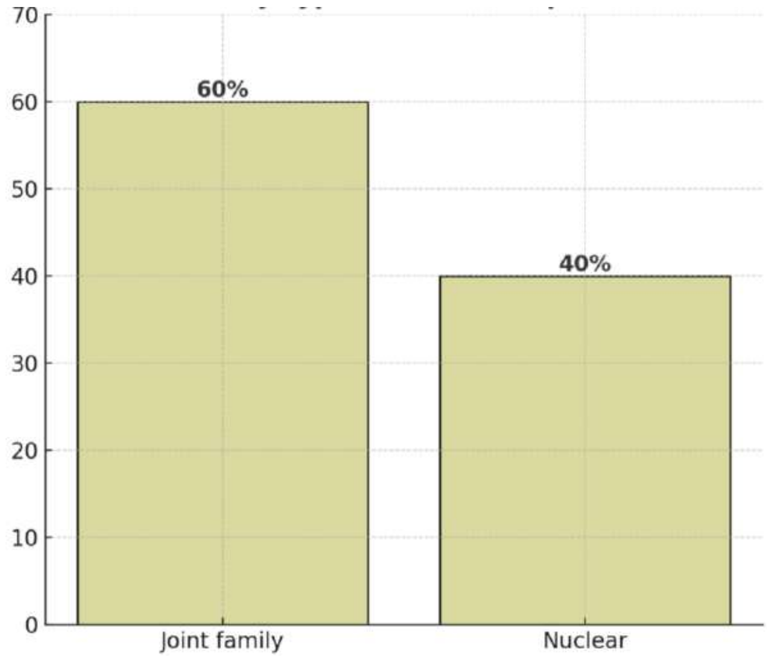
The sample was composed of equal numbers of male and female respondents, with 50% being males and 50% being females. This distribution indicates that the both genders were equally represented in the study, ensuring a balanced perspective between male and female participants.

4.1.2 Education of the Participants:



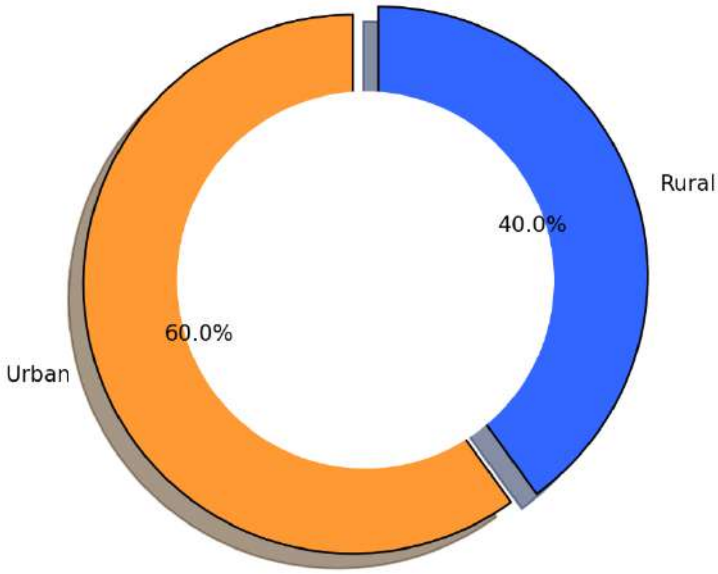
The sample was composed of respondents with varying levels of educational qualifications. Among them, 40% were secondary-level students, 20% had completed higher secondary education, and 40% were graduates. The distribution indicates that the majority of the participants were either at the secondary or graduate level, while a smaller proportion represented the higher secondary group.

4.1.3 Family type of the participants:



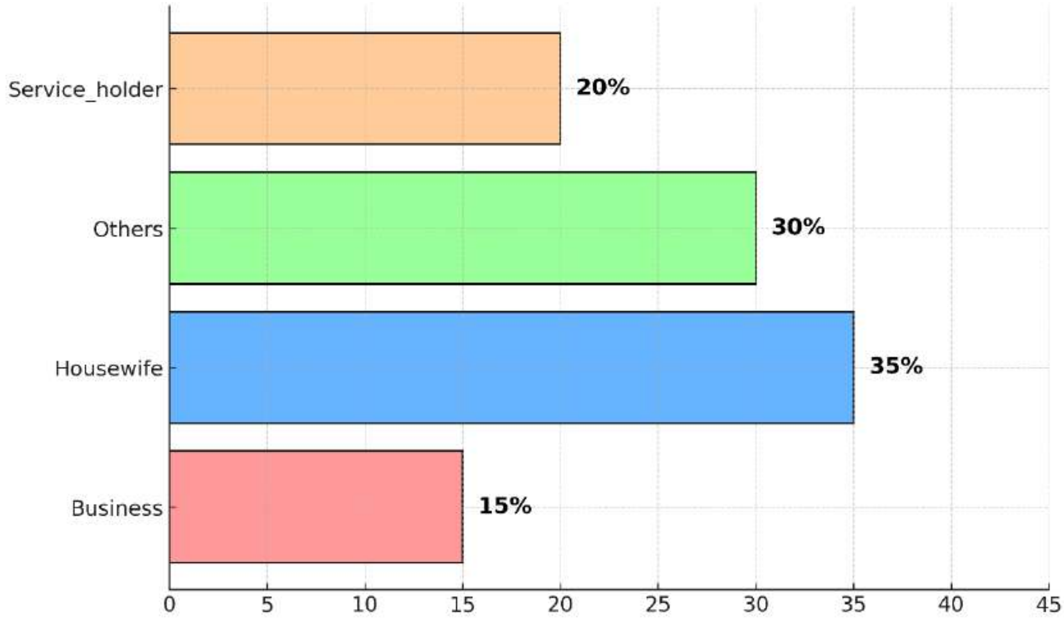
The sample consisted of respondents from both joint and nuclear families. Among them, 60% belonged to joint families, while 40% came from nuclear families. This distribution indicates that the majority of the participants were from joint families, reflecting a stronger representation of traditional family structures compared to nuclear families in the study.

4.1.4 Living area of the participants:



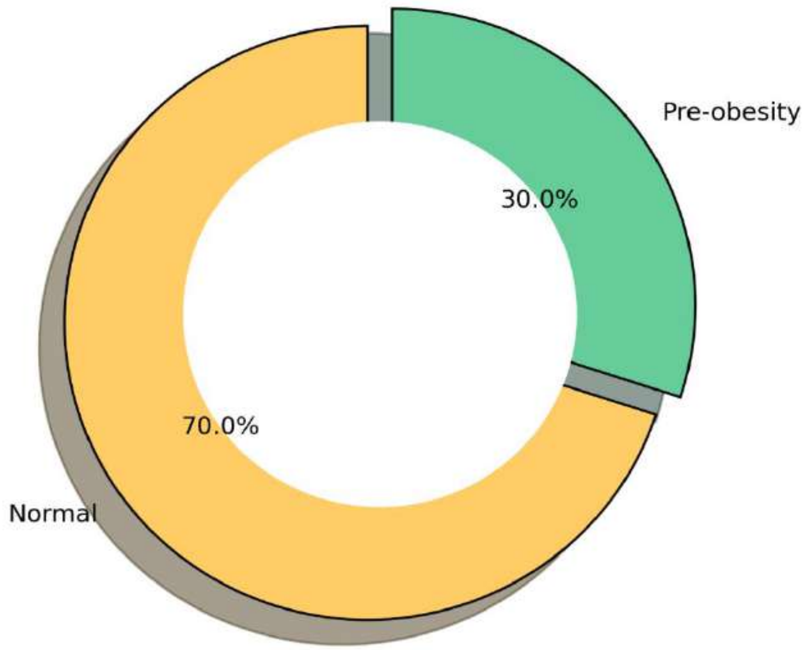
The distribution of participants according to their living area shows that 60% were from urban areas, while 40% were from rural areas. This indicates that the majority of the respondents came from urban settings, reflecting a stronger representation of urban participants compared to rural ones in the study**.**

4.1.5 Occupation of the participants:



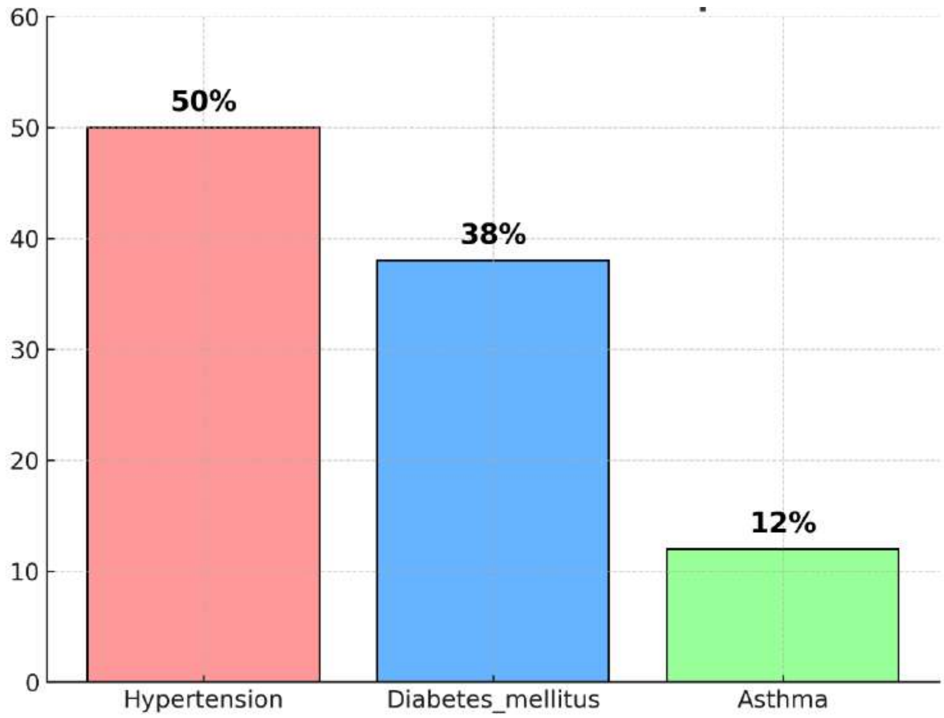
The respondents were engaged in diverse occupations. Among them, 35% were housewives, 30% belonged to other occupations, 20% were service holders, and 15% were involved in business. The distribution indicates that the majority of the participants were housewives, followed by those in other occupations, while service holders and business participants formed a smaller proportion of the study sample.

4.1.6 BMI (Body mass index) of the participants:



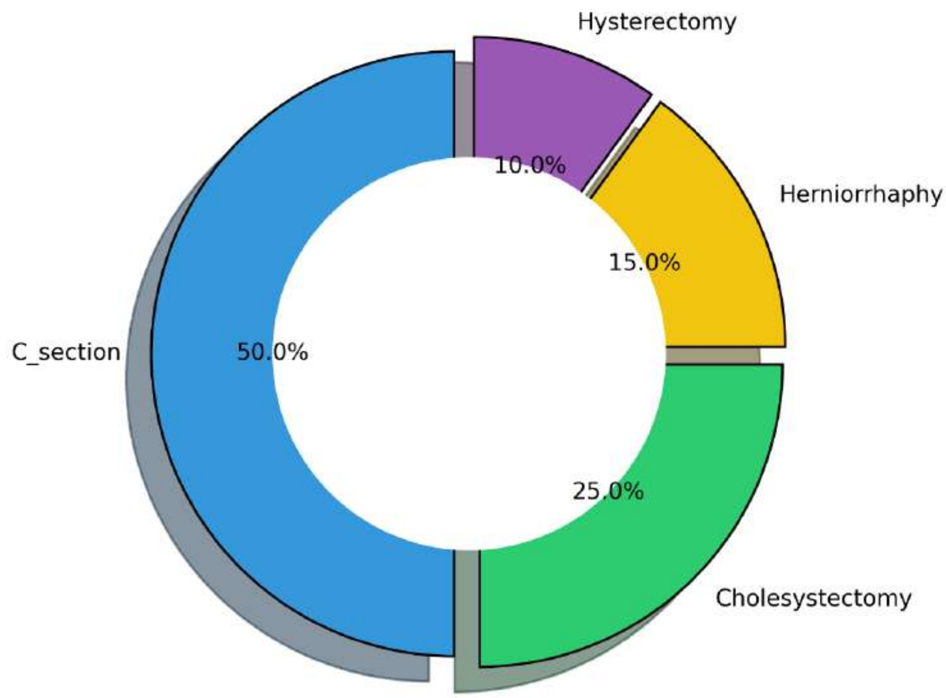
The Body Mass Index (BMI) distribution of the respondents shows that 70% of participants were within the normal BMI range, while 30% were classified as pre-obese. This indicates that the majority of the participants maintained a normal body weight, whereas a smaller portion exhibited a tendency toward pre-obesity.

4.1.7 Co-morbidities of the participants:



The distribution of co-morbidities among the participants reveals that half of the respondents 50% suffered from hypertension, making it the most common co-morbidity. Diabetes mellitus was reported by 38% of the participants, while 12% had asthma. This indicates that hypertension and diabetes were the predominant health issues within the sample, whereas asthma was comparatively less prevalent.

4.1.8 Surgical incision site of the participants:



The distribution of surgical incision sites among the respondents shows that half of the participants 50% had undergone C-section, making it the most common surgical procedure in the study. This was followed by 25% who had undergone cholecystectomy, 15% who had herniorrhaphy, and 10% who had hysterectomy. The findings indicate that C-section was the predominant surgical incision site, while hysterectomy was the least common among the participants.

Table no 2: Impact on FVC (Forced Vital Capacity) score before and after intervention.

Subjects of Experimental Group	FVC (pre)	FVC (post)
P-1	800	1300
P-2	1600	1700
P-3	900	900
P-4	1400	1900
P-5	1000	1400
P-6	1100	1500
P-7	1000	1000
P-8	1100	1400
P-9	900	1400
P-10	1100	1400
P-11	1100	1600
P-12	1200	1200
P-13	900	1000
P-14	800	900
P-15	1000	1100
P-16	800	800
P-17	1600	1800
P-18	900	1400
P-19	1400	1400
P-20	1000	1000
Mean ± SD	**1080± 246.23**	**1305± 311.99**

The outcomes indicate a remarkable improvement in Forced Vital Capacity (FVC) post-intervention. Mean FVC increased from 1080.00 ± 246.23 ml at baseline to 1305.00 ± 311.99 ml after the intervention, reflecting enhanced respiratory function. All 20 participants completed the assessment, and the majority demonstrated favorable improvements in FVC values following the exercise program. While variability was observed among individuals, the overall trend clearly indicated a positive change in respiratory capacity.

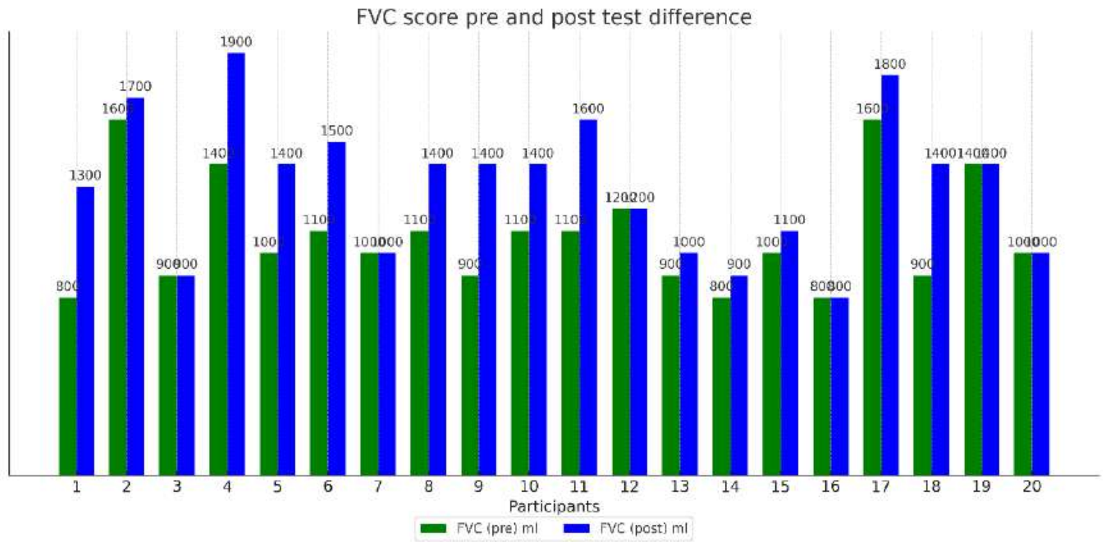


Table no 3: Impact on FVC (Forced Vital Capacity) score before and after treatment.

Pre test- Post test FVC scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	0	.00	.00	-3.322	0.001
Positive Ranks	14	7.50	105.0		
Ties	6				
Total	20				

The pre and post test Forced Vital Capacity (FVC) were compared using Wilcoxon Signed Rank Test. The analysis presented 14 positive ranks which means there were 14 subjects with better post-score FVC values than before, while all of the negative ranks (15) referred to those who did not decreased their pre-FVC functional capacity. Six significant ties were observed, indicating no shift in FVC for those subjects. The value of test statistics was -3.322(P =0.001) which is very significant. Further more, the results indicate that the intervention resulted in a significant increase in FVC among participants indicating a positive effect of the exercise program on pulmonary function.

Table no 4: Impact on FEV1 (Forced Expiratory Volume in 1 second) score before and after intervention.

Subjects of Experimental Group	FEV1 (pre)	FEV1(post)
P-1	640	1000
P-2	1300	1400
P-3	720	720
P-4	1000	1000
P-5	800	1100
P-6	880	1200
P-7	800	720
P-8	880	1120
P-9	720	1200
P-10	880	1120
P-11	880	1280
P-12	960	960
P-13	720	1200
P-14	640	1040
P-15	800	1280
P-16	640	1040
P-17	1300	1300
P-18	720	720
P-19	1000	1200
P-20	800	800
Mean ± SD	**854± 1070**	**188.52± 203.59**

The outcomes indicate a notable improvement in Forced Expiratory Volume in 1 second (FEV_1) following the intervention. The mean FEV_1 increased from 854.00 ± 188.52 ml at baseline to 1070.00 ± 203.59 ml post-intervention, suggesting better airway function and expiratory capacity. All 20 participants were included in the analysis, with the majority demonstrating favorable changes in FEV_1 values. Although some variability was observed across individuals, the overall trend clearly reflected an enhancement in expiratory performance after the intervention.

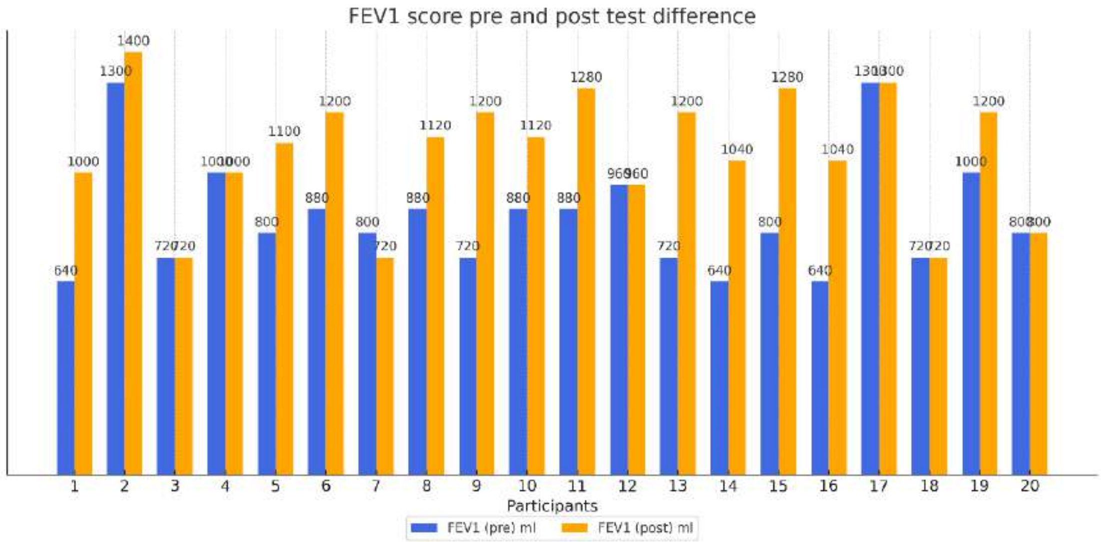


Table no 5: Impact on FEV1 score before and after treatment.

Posttest - Pretest FEV1 scores	N	Mean Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	1	1.00	1.00	-3.240	0.001
Positive Ranks	13	8.00	104.0		
Ties	6				
Total	20				

The Wilcoxon Signed Rank Test was conducted to evaluate changes in Forced Expiratory Volume in 1 second (FEV_1) before and after the intervention. The results showed 13 positive ranks, indicating improvement in FEV_1 among most participants, while 1 negative rank reflected a slight decline in one case. Additionally, 6 ties were observed, representing no change in values for those individuals. The test statistic was Z = -3.240 with a p-value of 0.001, indicating a statistically significant difference between pre- and post-test scores. These findings suggest that the intervention effectively enhanced expiratory performance and airway function in the majority of participants.

Table no 6: Impact on SpO2 (Oxygen saturation) score before and after intervention.

Subjects of Experimental Group	FEV1 (pre)	FEV1(post)
P-1	90%	96%
P-2	92%	96%
P-3	91%	95%
P-4	93%	95%
P-5	92%	97%
P-6	91%	92%
P-7	90%	95%
P-8	92%	94%
P-9	92%	90%
P-10	90%	93%
P-11	90%	96%
P-12	90%	95%
P-13	90%	88%
P-14	92%	95%
P-15	92%	87%
P-16	90%	93%
P-17	92%	94%
P-18	91%	95%
P-19	93%	95%
P-20	92%	90%
Mean ± SD	**91.25± 93.55**	**1.069± 2.781**

The outcomes demonstrate a clear improvement in oxygen saturation (SpO_2) following the intervention. The mean SpO_2 increased from 91.25 ± 1.07% at baseline to 93.55 ± 2.78% post-intervention, reflecting better oxygenation status among participants. All 20 participants were included in the analysis, and most showed favorable changes in SpO_2 values. While minor variability was noted, the overall trend indicated an enhancement in respiratory efficiency and oxygen delivery after the exercise program.

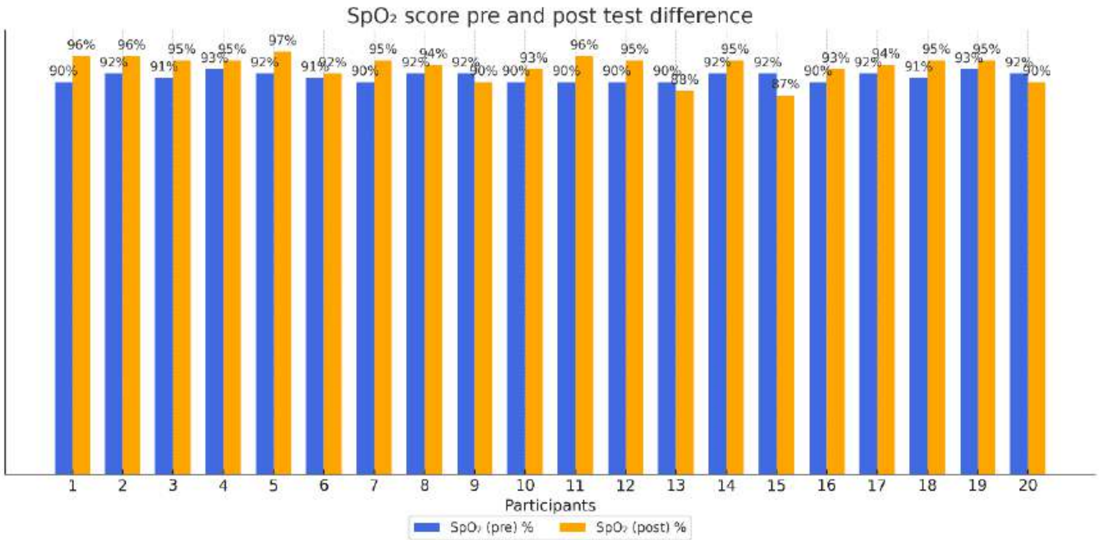


Table no 7: Impact on SpO2 (Oxygen saturation) score before and after treatment.

Posttest - Pretest SpO2 scores	N	Mean Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	4	7.88	31.50	-2.762	0.006
Positive Ranks	16	11.16	178.50		
Ties	0				
Total	20				

The Wilcoxon Signed Rank Test was applied to assess changes in oxygen saturation (SpO_2) before and after the intervention. The analysis revealed 16 positive ranks, indicating improved SpO_2 levels in the majority of participants, while 4 negative ranks reflected decreased values in a small proportion. No ties were observed, showing that all participants experienced a change in SpO_2 following the intervention. The test statistic was Z = -2.762 with a p-value of 0.006, confirming a statistically significant improvement in oxygen saturation post-intervention. These findings suggest that the exercise program contributed to enhanced respiratory efficiency and oxygen delivery in most participants.

Table no 8: Impact on Respiratory rate score before and after intervention.

Subjects of Experimental Group	Respiratory R (pre)	Respiratory R (post)
P-1	24	21
P-2	22	22
P-3	22	21
P-4	22	22
P-5	26	26
P-6	24	23
P-7	26	26
P-8	24	19
P-9	24	19
P-10	24	24
P-11	22	18
P-12	24	20
P-13	22	19
P-14	24	22
P-15	23	23
P-16	24	23
P-17	26	21
P-18	22	22
P-19	24	22
P-20	23	20
Mean ± SD	**23.60± 21.65**	**1.353± 2.183**

The outcomes reveal a positive change in respiratory rate following the intervention. The mean respiratory rate decreased from 23.60 ± 1.35 breaths per minute at baseline to 21.65 ± 2.18 breaths per minute post-intervention. This reduction suggests improved breathing control and efficiency among participants. All 20 individuals were included in the analysis, and most demonstrated favorable reductions in respiratory rate, although slight variability was observed across the sample. The overall findings indicate enhanced respiratory stability as a result of the exercise program.

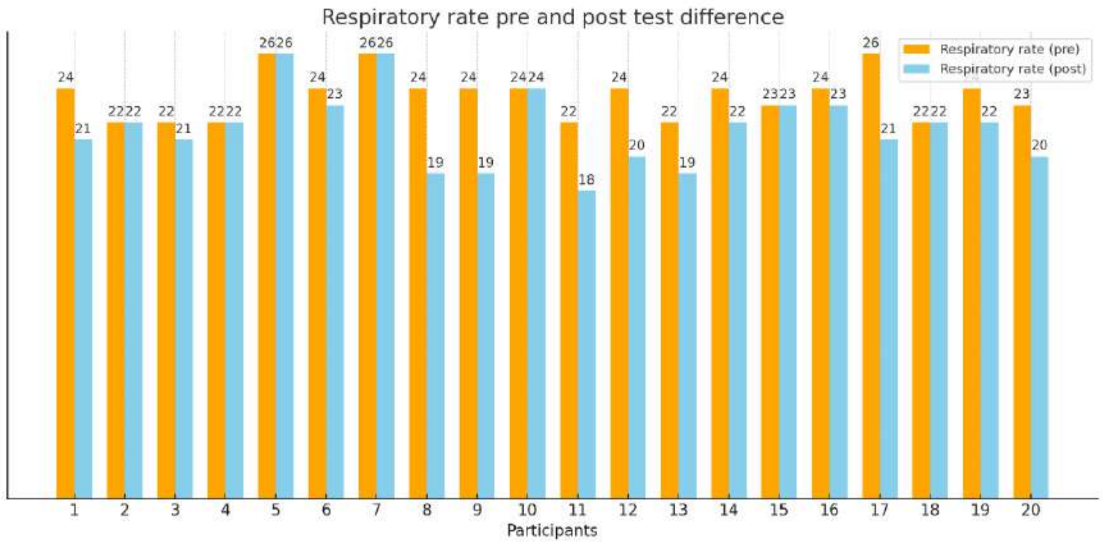


Table no 9: Impact on Respiratory rate score before and after treatment.

Posttest - Pretest Respiratory R scores	N	Mean Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	13	7.00	91.00	-3.193	0.001
Positive Ranks	0	.00	.00		
Ties	7				
Total	20				

The Wilcoxon Signed Rank Test was performed to evaluate differences in respiratory rate before and after the intervention. The analysis revealed 13 negative ranks, indicating that 13 participants experienced a reduction in respiratory rate post-intervention. No positive ranks were observed, meaning none of the participants showed an increase. Additionally, 7 ties were reported, representing no change between pre- and post-test scores for those individuals. The test statistic was Z = -3.193 with a p-value of 0.001, reflecting a highly significant reduction in respiratory rate. These results suggest that the intervention was effective in promoting improved breathing control and stability among participants.

Table no 10: Impact on Heart rate score before and after intervention.

Subjects of Experimental Group	Heart R (pre)	Heart R (post)
P-1	97	85
P-2	100	85
P-3	85	85
P-4	96	85
P-5	87	87
P-6	100	85
P-7	98	98
P-8	98	85
P-9	98	98
P-10	98	88
P-11	98	86
P-12	96	96
P-13	96	96
P-14	88	88
P-15	96	96
P-16	97	85
P-17	100	85
P-18	98	85
P-19	96	96
P-20	98	87
Mean ± SD	**96± 4.255**	**89.05± 5.236**

The outcomes indicate a significant improvement in heart rate response after the intervention. The mean heart rate decreased from 96.00 ± 4.26 bpm at baseline to 89.05 ± 5.24 bpm post-intervention, reflecting improved cardiovascular control and relaxation. All 20 participants were included in the analysis, with most showing favorable reductions in heart rate values. Although individual variations were observed, the overall trend suggested enhanced autonomic balance and reduced physiological stress following the exercise program.

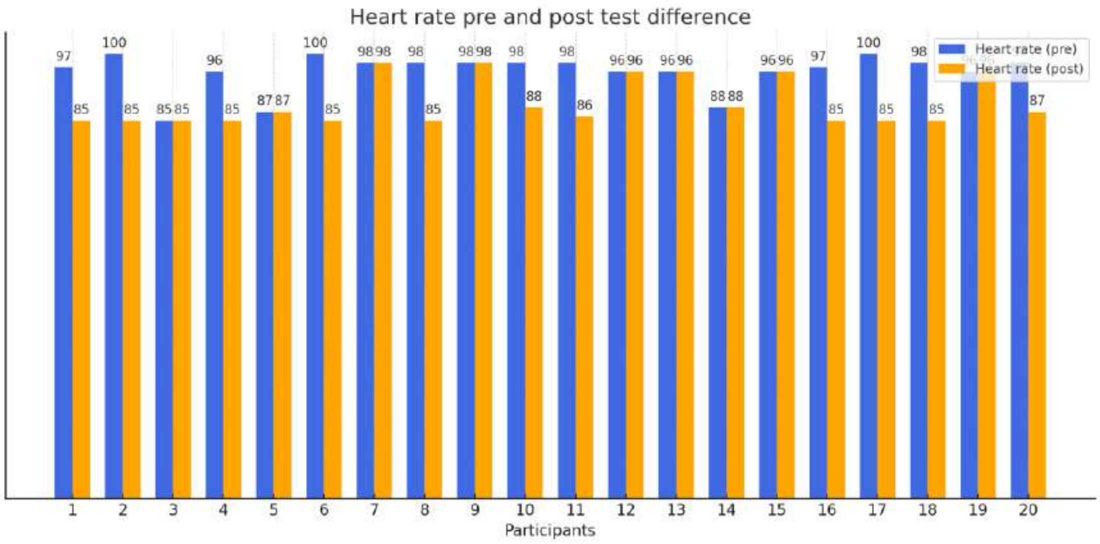


Table no 11: Impact on Heart rate score before and after treatment.

Posttest - Pretest Respiratory R scores	N	Mean Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	13	7.00	91.00	-3.193	0.001
Positive Ranks	0	.00	.00		
Ties	7				
Total	20				

The Wilcoxon Signed Rank Test was conducted to assess the effect of the intervention on respiratory rate. The analysis demonstrated 13 negative ranks, indicating that 13 participants showed a reduction in respiratory rate after the intervention, while no positive ranks were recorded, meaning no participants experienced an increase. A total of 7 ties were observed, suggesting stability in respiratory rate for those individuals. The test statistic was Z = -3.193 with a p-value of 0.001, confirming a statistically significant reduction in respiratory rate. These findings highlight that the intervention effectively contributed to improved breathing regulation and overall respiratory efficiency.

Table no 12: Impact on FIM (Fucntional Impairment Measure) score before and after intervention.

Subjects of Experimental Group	FIM (pre)	FIM (post)
P-1	25	54
P-2	26	51
P-3	37	49
P-4	51	51
P-5	21	45
P-6	12	38
P-7	17	31
P-8	24	24
P-9	17	17
P-10	21	21
P-11	19	44
P-12	21	56
P-13	32	55
P-14	23	47
P-15	34	36
P-16	25	25
P-17	26	51
P-18	37	38
P-19	51	51
P-20	21	45
Mean ± SD	**27± 4.145**	**10.498± 12.119**

The outcomes demonstrate a substantial improvement in Functional Independence Measure (FIM) scores following the intervention. The mean FIM score increased from 27.00 ± 10.50 at baseline to 41.45 ± 12.12 post-intervention, indicating notable gains in functional independence and daily activity performance among participants. All 20 individuals were included in the analysis, and the majority showed marked improvements. Although some variability in response was observed, the overall trend reflected enhanced functional capacity and self-sufficiency after completion of the exercise program.

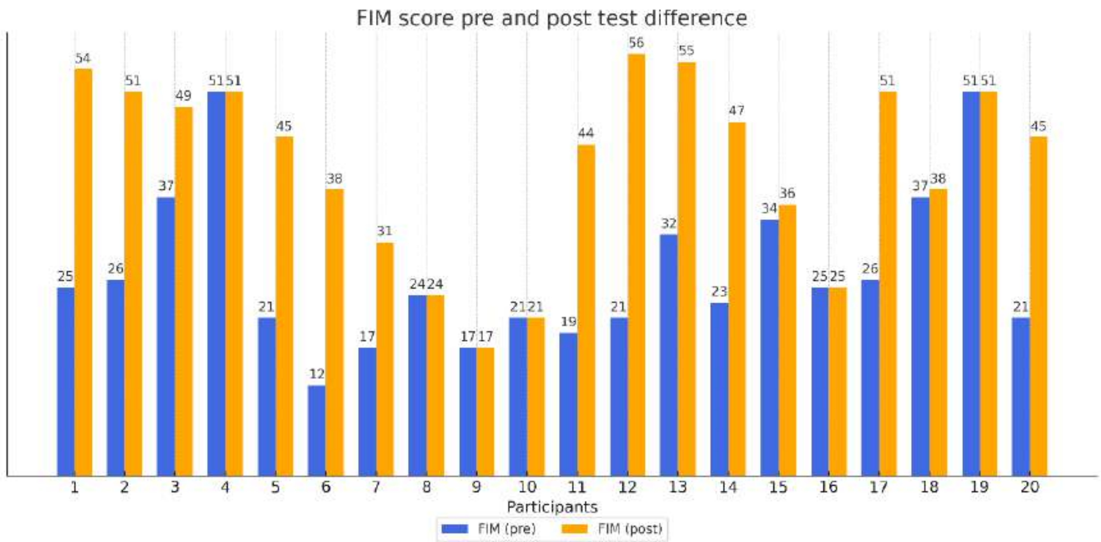


Table no 13: Impact on FIM (Fucntional Impairment Measure) score before and after treatment.

Pre test – post test FIM scores	N	Mean Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	0	.00	.00	-3.302	0.001
Positive Ranks	14	7.50	105.0		
Ties	6				
Total	20				

The Wilcoxon Signed Rank Test was performed to compare pre- and post-test Functional Independence Measure (FIM) scores. The analysis revealed 14 positive ranks, indicating that 14 participants experienced improvements in functional independence following the intervention. No negative ranks were observed, meaning none of the participants demonstrated a decline in FIM scores. A total of 6 ties were reported, reflecting unchanged scores for some individuals. The test statistic was Z = -3.302 with a p-value of 0.001, confirming a statistically significant improvement in FIM. These results suggest that the intervention was effective in enhancing functional capacity and independence in daily activities among participants.

Table no 14: Length of hospital stay:

Length of hospital stay	N	Range	Minimum	Maximum	Mean	Std. Deviation
	20	6	7	13	9.5	2.064

The length of hospital stay among participants (n = 20) varies from 6 days, with the minimum being 7 and the maximum being 13 days. The mean duration was 9.5 days with a standard deviation of 2.06.

CHAPTER: V	DISCUSSION & LIMITATIONS

This study evaluated the effectiveness of early ambulation and inspiratory muscle training (IMT) on recovery after abdominal surgery, with outcomes spanning pulmonary function (FVC, FEV_1), oxygenation (SpO_2), ventilatory and cardiovascular responses (respiratory rate, heart rate), and functional independence (FIM). Across four weeks, participants demonstrated clinically and statistically significant improvements: FVC increased from 1080.00 ± 246.23 ml to 1305.00 ± 311.99 ml (Wilcoxon Z = −3.322, p = 0.001), and FEV_1 rose from 854.00 ± 188.52 ml to 1070.00 ± 203.59 ml (Wilcoxon Z = −3.240, p = 0.001). These gains indicate enhanced lung volume and expiratory flow, consistent with the physiological targets of IMT (diaphragmatic strength, improved thoracoabdominal mechanics) and the de-recruitment reversal expected from early mobilization.

The oxygenation profile also improved: SpO_2 rose from 91.25 ± 1.07% to 93.55 ± 2.78% (Wilcoxon Z = −2.762, p = 0.006). Concomitantly, respiratory rate decreased from 23.60 ± 1.35 to 21.65 ± 2.18 breaths/min (Wilcoxon Z = −3.193, p = 0.001), and heart rate declined from 96.00 ± 4.26 to 89.05 ± 5.24 bpm, supporting improved ventilatory efficiency and autonomic stabilization. Functionally, FIM increased from 27.00 ± 10.50 to 41.45 ± 12.12 (Wilcoxon Z = −3.302, p = 0.001), reflecting meaningful gains in mobility, transfers, and self-care. Taken together, the pattern suggests that pairing IMT with very early upright activity/ambulation addresses both the respiratory impairment of upper abdominal surgery (reduced FRC, basal atelectasis) and the deconditioning risk associated with bed rest.

This is consistent with high-quality evidence that IMT does decrease the incidence of postoperative pulmonary complications (PPCs) and length of stay. In a Cochrane review focusing on adult patients undergoing cardiac and major abdominal surgery (12 trials, n=695), preoperative IMT resulted in the reduction of atelectasis (RR 0.53; 95% CI 0.34–0.82), pneumonia (RR.45; 95% CI.26–.77) and length of stay (MD −1.33 days; 95% CI −2.53 to −0.13). Mechanically, IMT augmented inspiratory muscle strength without further adverse effects, supporting the safety and feasibility for surgical routes. Your significant FVC and FEV_1 gains mirror these mechanistic benefits.

Another large meta-analysis (17 RCTs) showed that IMT is associated with a 50% reduction in odds of PPCs (RR 0.50, 95% CI 0.39–0.64) and reduced LOS by 1.4 days (MD −1.41, 95% CI −2.07 to −0.75), with older and higher-risk surgical patients benefitting most an important consideration given the wide age range within your sample (mean =45.25 ±18.68).The authors also note that supervised IMT for ≥2 weeks with progressive loading yields the best results, which matches the structured nature of your program.

On the mobilization side, your improved SpO_2 is directly supported by a three-arm randomized controlled trial where mobilization within 2 hours after abdominal surgery improved SpO_2 (MD 2.5%) and PaO_2 (MD 1.40 kPa) versus controls; adding breathing exercises conferred additional oxygenation benefit during early recovery. This immediate physiologic signal is consistent with your SpO_2 rise and RR decrease, suggesting better alveolar ventilation and gas exchange when patients are moved upright early rather than remaining supine.

Within enhanced recovery pathways, early mobilization is repeatedly linked to fewer complications, faster return of walking capacity, and shorter length of stay. Narrative and systematic reviews in ERAS emphasize early mobilization as a core element that counteracts surgical stress, improves patient-reported outcomes, and reduces costs coherent with your observed gains in FIM and vital signs. At the same time, not all trials show uniform improvements in every endpoint; for example, a colorectal ERP RCT found that staff-facilitated early mobilization did not change postoperative pulmonary function or PPCs highlighting that context matters (baseline pathway quality, mobilization dose, and concurrent therapies). Your significant functional and respiratory improvements suggest your combined approach (IMT + early ambulation) achieved a therapeutic "dose" sufficient to shift outcomes, which may not occur with mobilization alone in tightly protocolized ERAS settings.

Recent RCT data specific to upper abdominal surgery also indicate that fully engaged IMT reduces PPCs and increases inspiratory muscle strength and diaphragm function mechanistic findings that map well to your FVC/FEV_1 improvements and lower RR. In parallel, contemporary ERAS meta-analyses associate adherence to ERAS elements (including early mobilization) with fewer complications and shorter hospital stays, supporting the system-level plausibility of your functional and physiologic improvements.

In summary, your data show that pairing IMT with very early ambulation produces coherent improvements across physiologic (FVC, FEV_1, SpO_2, RR, HR) and functional (FIM) domains in postoperative abdominal surgery patients. This pattern is directionally and mechanistically consistent with high-level evidence that IMT reduces PPCs and LOS and that early mobilization enhances oxygenation and functional recovery. Where trials of mobilization alone within ERPs have shown mixed effects on PPCs, your results support the synergy of respiratory muscle loading and upright/functional activity as a pragmatic physiotherapy package for early recovery.

When compared with existing literature, your results are consistent with high-quality trials and meta-analyses that emphasize the value of IMT and early mobilization in surgical recovery. For example, preoperative and postoperative IMT has consistently been shown to reduce the incidence of postoperative pulmonary complications (PPCs), shorten hospital length of stay, and improve inspiratory muscle strength without adding adverse events. Likewise, early ambulation is a cornerstone of enhanced recovery protocols, mitigating deconditioning and promoting functional recovery. The combination approach in your study likely provided a therapeutic dose sufficient to produce measurable improvements, whereas interventions that focus solely on mobilization or IMT may show more variable effects depending on timing, intensity, and patient adherence.

Moreover, the age diversity in your sample (mean 45.25 ± 18.68 years) highlights that this combined physiotherapy package is effective across a wide spectrum of adult patients, including both younger and older adults who may differ in baseline physical capacity and postoperative vulnerability. This aligns with previous evidence suggesting that high-risk and older surgical patients derive the greatest benefit from structured, supervised IMT and early mobilization programs.

In practical terms, these findings have important implications for clinical rehabilitation pathways. Incorporating structured IMT alongside early ambulation may enhance postoperative recovery, reduce the burden of pulmonary complications, and support faster functional reintegration. The intervention is feasible, safe, and easily implementable, suggesting that such combined strategies can be integrated into standard physiotherapy protocols for abdominal surgery patients to optimize outcomes.

In conclusion, the study demonstrates that early ambulation paired with inspiratory muscle training produces coherent, clinically meaningful improvements across respiratory, cardiovascular, and functional domains. This synergy likely reflects mechanistic benefits at the muscular, pulmonary, and systemic levels, aligning with and extending current evidence supporting enhanced recovery protocols. Future studies could further explore the optimal timing, intensity, and duration of combined IMT and mobilization interventions, as well as their long-term effects on functional independence and quality of life.

Limitations of the Study:

1. **Small Sample Size:** The study included only 20 participants, which restricts the generalizability of findings.
2. **No Control Group:** Without a control or comparison group, improvements cannot be attributed solely to the intervention.
3. **Single-Center Study:** All participants were recruited from one hospital, limiting external validity across different clinical settings.
4. **Short Duration:** The intervention and follow-up were limited to the immediate postoperative period; long-term outcomes were not assessed.
5. **Surgical Variability:** Differences in type of abdominal surgery and patient comorbidities may have influenced results, reducing uniformity.

CHAPTER: VI	CONCLUSION & RECOMMENDATION

6.1 Conclusion:

This study was conducted to assess the efficacy of early ambulation and inspiratory muscle training (IMT) for patients undergoing abdominal surgery. The data showed that 4 weeks of structured physiotherapy intervention resulted in significant changes in various parameters including pulmonary function (FVC, FEV_1) and oxygenation (SpO_2), ventilatory efficiency (decreased respiratory rate), and cardiovascular stability (decreased heart rate). Functional recovery according to the FIM assessment also recovered much better, reflecting that patients were able to regain function of their daily life more efficiently in the postoperative period.

These findings suggest that combining respiratory-focused training with early mobilization provides dual benefits: IMT strengthened inspiratory muscles, preventing pulmonary complications, while ambulation reduced physical deconditioning and accelerated overall functional recovery. The consistent improvements observed across multiple physiological and functional domains highlight the clinical importance of incorporating these two strategies into postoperative care.

By contrast, some variability was observed among participants, particularly in functional outcomes, where improvements were not uniform across all cases. This may indicate that while short-term interventions are effective in producing measurable benefits, longer-duration or adjunctive rehabilitation programs may be required to fully capture the long-term impact on physical endurance and quality of life.

Nevertheless, this study has certain limitations. The sample size was small ($n = 20$), restricting generalizability. The study was conducted in a single center, and the intervention period was relatively short, meaning the long-term sustainability of benefits remains unknown. Furthermore, outcomes such as FVC, FEV_1, and FIM, though objective, may also be influenced by patient effort and adherence.

Overall, the study provides promising preliminary evidence that early ambulation and inspiratory muscle training are effective, safe, and feasible strategies to enhance postoperative recovery following abdominal surgery. Improvements in pulmonary parameters, oxygenation, and functional independence support the inclusion of these interventions into standard physiotherapy practice and enhanced recovery after surgery (ERAS) protocols.

6.2 Recommendations:

1. **Expand to Multiple Centers:** Future studies should be conducted across a variety of hospitals and surgical units to strengthen the external validity and ensure the applicability of findings across diverse patient populations.
2. **Include Long-Term Follow-Up:** Future research should track patients beyond the immediate postoperative period to determine whether improvements in pulmonary function, oxygenation, and functional independence are sustained over time.
3. **Conduct Larger Randomized Controlled Trials:** To provide more robust evidence, future studies should include larger sample sizes within randomized controlled trial designs, thereby increasing statistical power and reliability of conclusions.
4. **Compare with Other Rehabilitation Strategies:** Research should compare early ambulation and IMT with other physiotherapy interventions (e.g., incentive spirometry, aerobic training, or stretching) and pharmacological approaches to identify the most effective or synergistic strategies.
5. **Integration into ERAS Programs:** Given their safety, simplicity, and cost-effectiveness, early ambulation and IMT should be incorporated into enhanced recovery after surgery protocols to improve outcomes and reduce postoperative complications.

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APPENDIX: A

SAIC COLLEGE OF MEDICAL SCIENCE AND TECHNOLOGY

Approved by Ministry of Health and Family Welfare
Affiliated with Dhaka University

Ref : *Date :* ....

SCMST-BPT/IRB/.12-06/25 -24/02

To
Tahmida Binte Naher
4th Year Student of B.Sc. in Physiotherapy
Session: 2019-20, Reg No: 8803
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Subject: Approval of the thesis proposal " **Efficacy of Early Functional Ambulation and Inspiratory Muscle Training for the management of Abdominal Surgery Patients-** " by ethics committee.

Dear Tahmida Binte Naher
Congratulations.
The Institutional Review Board (IRB) of SCMST has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Research proposal.
2	Structured Questionnaire (English & Bangla version)
3	Information sheet & consent form.

The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 4th September 2024 at SCMST.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring during the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

04.09.25.

Dr. Abul Kasem Mohammad Enamul Haque
Principal, SCMST &Chairman, Institutional Review Board (IRB)
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Address: Saic Tower, M-1/6, Mirpur-14, Dhaka-1206. Mobile: 01936005804
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APPENDIX: B

বিআরবি হসপিটালস লিমিটেড
BRB HOSPITALS LIMITED

ISO 9001:2015 CERTIFIED

77/A, East Rajabazar,
West Panthapath, Dhaka-1215
Care Line: 10647
E-mail: info@brbhospital.com
Web: www.brbhospital.com

Date:
To
The Coordinator

BRB Hospitals Ltd.

77/A, Panthapath, Dhaka - 1215

Subject: **Prayer for permission to collect data from BRB Hospitals Limited, 77/A, Panthapath, Dhaka-1215, Bangladesh to conduct a research project.**

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy SAIC College of medical science and technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is "Efficacy of Early Functional Ambulation and Inspiratory Muscle Training for the Management of Abdominal Surgery Patient" and The aim of study to find out the efficacy of early functional ambulation and inspiratory muscle training for the management of abdominal surgery patient. This is a Quasi Experimental study under the supervisor Dr. Md. Feroz Kabir (PT), Ass. Professor department of Physiotherapy and Rehabilitation of JUST. I have chosen the BRB Hospitals Limited, 77/A Panthapath, Dhaka 1215, Bangladesh to collect data from the patient with abdominal surgery.

So, I, therefore, pray and hope that you would be kind enough to give permission for data collection that will help me to complete my study.

Yours Faithfully
Tahmida Binte Naher
B.Sc.inPhysiotherapy(4th Year) Session: 2019-2020
SCMST, Mirpur-14, Dhaka-1216, Bangladesh.

Md. Feroz Kabir
Coordinator
Physiotherapy Center
BRB Hospitals Ltd.

a concern of BRB

APPENDIX: C

Questionnaire Bangla and English

সম্মতি পত্র

আমি তাহমিদা বিনতে নাহার, সাইক কলেজ অব মেডিকেল সায়েন্স এন্ড টেকনোলজির বিএসসি ইন ফিজিওথেরাপি চতুর্থ বর্ষের শিক্ষার্থী। আমার গবেষণার জন্য একটি সমীক্ষা পরিচালনা করছি। গবেষণার শিরোনাম: "ইফিকেসি অফ আর্লি ফাংশনাল অ্যাম্বুলেশন অ্যান্ড ইনস্পিরেটরি মাসল ট্রেনিং ফর দ্য ম্যানেজমেন্ট অফ অ্যাবডোমিনাল সার্জারি পেশেন্ট "

এই গবেষণার উদ্দেশ্য হল অ্যাবডোমিনাল সার্জারি করা রোগীদের ক্ষেত্রে শারীরিক সুস্থতা দ্রুত অর্জনে প্রারম্ভিক কার্যকরী হাঁটা এবং ইনস্পিরেটরি মাসল ট্রেনিং পদ্ধতির কার্যকারিতা মূল্যায়ন করা।

আপনাকে নিশ্চিত করছি যে আপনার প্রদত্ত সকল তথ্য সম্পূর্ণ গোপন রাখা হবে এবং রিপোর্টে কোনো ব্যক্তিগত নাম প্রকাশ করা হবে না।

সাইক কলেজ অব মেডিকেল সায়েন্স অ্যান্ড টেকনোলজি (SCMST) এই গবেষণার অনুমতি দিয়েছে,আপনার অংশগ্রহণ সম্পূর্ণ স্বেচ্ছাসেবী এবং আপনি যেকোনো সময় অংশগ্রহণ প্রত্যাহার করতে পারেন।

যদি আপনার কোনো প্রশ্ন থাকে, আপনি আমার গবেষণা তত্ত্বাবধায়ক ডা. মোঃ ফিরোজ কবির, সহকারী অধ্যাপক ও চেয়ারম্যান, ফিজিওথেরাপি ও পুনর্বাসন বিভাগ, যশোর বিজ্ঞান ও প্রযুক্তি বিশ্ববিদ্যালয় (JUST)-এর সাথে যোগাযোগ করতে পারেন।

হ্যাঁ [ ]   না [ ]

অংশগ্রহণকারীর স্বাক্ষর: ....   তারিখ: ....

সাক্ষীর স্বাক্ষর: ....   তারিখ: ....

ফিজিওথেরাপিস্টের স্বাক্ষর: ....   তারিখ: ....

গবেষকের স্বাক্ষর: ....   তারিখ: ....

প্রশ্নাবলী সংস্করণ

টাইটেল: ইফিকেসি অফ আর্লি ফাংশনাল অ্যাম্বুলেশন অ্যান্ড ইনস্পিরেটরি মাসল ট্রেনিং ফর দ্য ম্যানেজমেন্ট অফ অ্যাবডোমিনাল সার্জারি পেশেন্ট

অংশগ্রহণকারীর আইডি: ___________
তারিখ: __ / __ / ____
মূল্যায়নকারী ব্যক্তির নাম: __________________

পর্ব ১: ব্যক্তিগত তথ্য

ক্রম	**বিবরণ**	**তথ্যপূর্ণ স্থান**
১.১	রোগীর আইডি	
১.২	পরীক্ষার তারিখ	
১.৩	অংশগ্রহণকারীর নাম	
১.৪	কোড	
১.৫	ঠিকানা	
	গ্রাম	
	ডাকঘর	

পর্ব ২: রোগীর সামাজিক ও জনতাত্ত্বিক তথ্য

সঠিক উত্তরে টিক (✓) চিহ্ন দিন

প্রশ্ন নং	প্রশ্ন	উত্তর
২.১	বয়স:	_________ বছর
২.২	লিঙ্গ:	☐ ০. পুরুষ ☐ ১. মহিলা
২.৩	ধর্ম:	☐ ০. ইসলাম ☐ ১. হিন্দু ☐ ২. অন্যান্য: ____________

২.৪	বৈবাহিক অবস্থা:	☐ ০. বিবাহিত ☐ ১. অবিবাহিত
২.৫	পরিবারের ধরণ:	☐ ০. একক পরিবার ☐ ১. যৌথ পরিবার
২.৬	বসবাসের এলাকা:	☐ ০. গ্রাম ☐ ১. শহর
২.৭	শিক্ষাগত যোগ্যতা:	☐ ০. নিরক্ষর ☐ ১. প্রাথমিক ☐ ২. মাধ্যমিক ☐ ৩. উচ্চ মাধ্যমিক ☐ ৪. স্নাতক ☐ ৫. স্নাতকোত্তর ☐ ৬. অন্যান্য: ____________
২.৮	পেশা:	☐ ০. ছাত্র/ছাত্রী ☐ ১. গৃহিণী ☐ ২. শ্রমিক ☐ ৩. চাকরিজীবী ☐ ৪. ব্যবসায়ী ☐ ৫. অন্যান্য: ____________
২.৯	মাসিক আয়:	____________________ টাকা

পর্ব ৩: শারীরিক পরিমাপ

সঠিক উত্তরে টিক (✓) চিহ্ন দিন

ক্রমিক	প্রশ্ন	উত্তর
৩.১	উচ্চতা:	________________________________
৩.২	ওজন:	_________________________________ কেজি
৩.৩	বিএমআই (BMI):	___________________________
৩.৪	সহ-রোগসমূহ (Co-morbidities):	☐ ০. ডায়াবেটিস মেলিটাস ☐ ১. উচ্চ রক্তচাপ ☐ ২. হাঁপানি ☐ ৩. যক্ষ্মা ☐ ৪. অন্যান্য: ___________________
৩.৫	রোগ নির্ণয় (Diagnosis):	
৩.৬	অস্ত্রোপচারের সময়কাল	
৩.৭	অস্ত্রোপচারের নাম	

পর্ব ৪: শারীরিক কার্যক্রম

(কার্যকরী স্বনির্ভরতা পরিমাপক (FIM) স্কেল)

ফাংশনাল ইন্ডিপেনডেন্স

স্কোর	সহযোগিতার স্তর	বর্ণনা
৭	সম্পূর্ণ স্বাধীন	কোনো সাহায্য ছাড়াই কাজ সম্পন্ন করেন
৬	সহায়তাভিত্তিক স্বাধীন	যন্ত্র ব্যবহার করেন, তবে শারীরিক সাহায্য লাগে না
৫	তত্ত্বাবধানে স্বাধীন	কাজটি রোগী নিজে করে, তবে কারও উপস্থিতি দরকার
৪	ন্যূনতম সহায়তা	রোগী নিজের অধিকাংশ কাজ করলেও কিছু হালকা সহায়তা লাগে

৩	মাঝারি সহায়তা	রোগী ও সহায়কের যৌথ প্রচেষ্টায় কাজটি সম্পন্ন হয়
২	সর্বাধিক সহায়তা	রোগীর নিজস্ব অংশগ্রহণ সীমিত, সহায়তা প্রধান ভূমিকা পালন করে
১	সম্পূর্ণ সহায়তা	রোগী নিজের দ্বারা কাজটি একেবারেই করতে অক্ষম

FIM স্কোর তুলনামূলক শীট :

কার্যকরী উপাদান	**প্রাক স্কোর**	**পর স্কোর**	**পার্থক্য**
১। খাওয়া	____	____	____
২। পরিষ্কার-পরিচ্ছন্নতা	____	____	____
৩। গোসল	____	____	____
৪। উপরিভাগের পোশাক পরিধান	____	____	____
৫। নিচের পোশাক পরিধান	____	____	____
৬। টয়লেট ব্যবহার	____	____	____
৭। মূত্র নিয়ন্ত্রণ	____	____	____
৮। মল নিয়ন্ত্রণ	____	____	____
৯। বিছানা/চেয়ার/হুইলচেয়ার স্থানান্তর	____	____	____
১০। টয়লেট স্থানান্তর	____	____	____
১১। বাথরুম স্থানান্তর	____	____	____
১২। হাঁটা/হুইলচেয়ার ব্যবহার	____	____	____
১৩। সিঁড়ি ওঠা/নামা	____	____	____
১৪। বোঝার ক্ষমতা	____	____	____
১৫। নিজেকে প্রকাশের ক্ষমতা	____	____	____
১৬। সামাজিক আচরণ	____	____	____
১৭। সমস্যা সমাধান	____	____	____
১৮। স্মৃতি	____	____	____
মোট FIM স্কোর	____ / 126	____ / 126	____

পর্ব ৫: শ্বাসতন্ত্রের কার্যকারিতা মূল্যায়ন

শ্বাসতন্ত্রের কার্যকারিতার পরিস্থিতি	প্রি-টেস্ট	পোস্ট-টেস্ট
রেস্টিং হার্ট রেট (পালস অক্সিমিটার)		
রেসপিরেটরি রেট (পালস অক্সিমিটার)		
হাঁটার রেট (পালস অক্সিমিটার)		
ফোর্সড ভাইটাল ক্যাপাসিটি : (স্পাইরোমেট্রি পরিমাপ)		
এক সেকেন্ডে প্রশ্বাসের বল: (স্পাইরোমেট্রি পরিমাপ)		
অক্সিজেন স্যাচুরেশন লেভেল: (পালস অক্সিমিটার)		

পর্ব ৬: হাসপাতালে থাকার সময়কাল

প্রশ্ন নং	প্রশ্ন	উত্তর লেখার স্থান
৫.১	ভর্তির তারিখ	
৫.২	অস্ত্রোপচারের তারিখ	
৫.৩	ছাড়পত্রের তারিখ	
৫.৪	মোট হাসপাতালে থাকার সময়কাল (দিন):	

Informed consent

Title: Efficacy of early functional ambulation and inspiratory muscle training for the management of abdominal surgery patient – A quasi-experimental study.

Thanks in advance for being a part of my study. My name is Tahmida Binte Naher. I am a student of Saic College of Medical Science and Technology (SCMST). As a part of my academic course requirement I need to conduct a research work. The aim of my research topic is to find out the **Efficacy of early functional ambulation and inspiratory muscle training for the management of abdominal surgery patient – A quasi-experimental study**. This will be a experimental type of study. I assure you that all data will be kept confidential. In report information will be presented in the form of group. No name will be mentioned. For your information Saic College of Medical Science and Technology (SCMST) has permitted me to do the research.

Your co-operation in answering a few questions will be highly appreciated.

If you have any queries about the study? You may contact with my supervisor Dr. Md. Feroz Kabir, Assistant Professor and Chairman, Department of Physiotherapy and Rehabilitation, Jashore University of Science and Technology (JUST). Do you have any question before I start?

So, may I have your consent to proceed with the interview?

Yes ☐ No ☐

Signature of the Participant and date ________________________________

Signature of the Interviewer and date _______________________________

Witness signature and date ______________________________

Date of interview:

Address of participant:

Questionnaire (English)

Research title: Efficacy of early functional ambulation and inspiratory muscle training for the management of abdominal surgery patient- A quasi-experimental study.

Part 1: Personal information

<table>
<tr><td>1.1 Patient ID:</td><td colspan="2"></td></tr>
<tr><td>1.2 Date of Test:</td><td colspan="2"></td></tr>
<tr><td>1.3 Name of participant:</td><td colspan="2"></td></tr>
<tr><td>1.4 Code:</td><td colspan="2"></td></tr>
<tr><td rowspan="2">1.5 Address:</td><td>Village:</td><td>Post-office:</td></tr>
<tr><td>Upazila:</td><td>District:</td></tr>
<tr><td>1.6 Phone:</td><td colspan="2"></td></tr>
</table>

Part 2: Patient's Socio-demographic information

Please give a tick (✓) mark in the correct answer

No.	Questions	Response
2.1	**Age:**	Year
2.2	**Gender:**	0. Male 1. Female
2.3	**Religion:**	0. Islam 1. Hindu 2. Others ………………….
2.3	**Marital status:**	0. Married 1. Unmarried
2.4	**Family type:**	0. Nuclear Family 1. Join Family
2.5	**Living area**	0. Rural 1. Urban
2.6	**Educational qualification:**	0. Illiterate 1. Primary 2. Secondary 3. Higher secondary 4. Graduated 5. Post graduation 6. Others ………………….
2.7	**Occupation:**	0. Student 1. Housewife 2. Worker 3. Service holder 4. Business 5. Others ………………
2.8	**Monthly income**	

Part 3: Anthropometric measurements

Please give a tick (✓) mark in the correct answer

No.	Questions	Response
3.1	**Height:**	
3.2	**Weight:**	**………………………….. KG**
3.3	**BMI:**	
3.4	**Co-morbidities:**	**0. Diabetes mellitus** **1. Hypertension** **2. Asthma** **3. Tuberculosis** **4. Others ………………….**
3.5	**Diagnosis**	

Part 4: Physical activities

(Functional independence measurement (FIM) scale)

Score	Level of Assistance	Description
7	Complete Independence	No helper, no device, safely and timely
6	Modified Independence	Requires device but no physical help
5	Supervision or Setup	Verbal cues or setup only
4	Minimal Assistance	Patient does ≥75% of the effort
3	Moderate Assistance	Patient does 50–74% of the effort
2	Maximal Assistance	Patient does 25–49% of the effort
1	Total Assistance	Patient does <25% of the effort

.

FIM Score Comparison Sheet (Pre & Post Intervention)

Functional Item	**Pre-Test Score**	**Post-Test Score**	**Difference**
1. Eating			
2. Grooming			
3. Bathing			
4. Dressing – Upper Body			
5. Dressing – Lower Body			
6. Toileting			
7. Bladder Management			
8. Bowel Management			
9. Bed, Chair, Wheelchair Transfers			
10. Toilet Transfers			
11. Tub/Shower Transfers			
12. Walking or Wheelchair Use			
13. Stairs			
14.Comprehension			
15. Expression			
16. Social Interaction			
17. Problem Solving			
18. Memory			
Total FIM Score	____ / 126	____ / 126	

Part 5: Cardiopulmonary function assessment

1. Respiratory Functional Parameters	**Pre-Test**	**Post-Test**
2. Resting Heart Rate (Pulse Oximeter)		
3. Respiratory Rate (Pulse Oximeter)		
4. Walking Rate (Pulse Oximeter)		
5. Forced Vital Capacity FVC (Spirometry Measurement)		
6. Forced Expiratory Volume in 1 Second (Spirometry)		
7. Oxygen Saturation Level (SPO2) (Pulse Oximeter)		

Part 6: Length of Hospital Stay

6.1	Date of Admission:	
6.2	Date of Surgery:	
6.3	Date of Discharge:	
6.4	Total Length of Hospital Stay (days):	

APPENDIX: C

<u>Gantt Chart</u>

Activities/ Months	Jun 24	Jul 24	Aug 24	Sep 24	Oct 24	Nov 24	Dec 24	Jan 25	Feb 25	Mar 25	Apr 25	May 25	Jun 25	Jul 25
Proposal Presentation														
Introduction														
Literature Review														
Methodology														
Data Collection														
Data Analysis														
Result														
1st progress Presentation														
Discussion														
Conclusion and Recommendation														
2nd progress Presentation														
Communication with supervisor														
Final Submission														