EFFECTIVENESS OF CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY ON POSTOPERATIVE RESPIRATORY STATUS AND RESPIRATORY COMPLICATIONS AMONG CHILDREN UNDERGOING ABDOMINAL SURGERY

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CERTIFICATE

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"I will praise you, O Jesus, with my whole heart,

I will tell all your marvelous works,

I will be glad and rejoice in you;

I will sing and praise your name, oh! Most high"

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ABSTRACT

This study intended to evaluate the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status and respiratory complications among children undergoing abdominal surgery. The conceptual framework of the study was based on J.W.Kenny's open system model. Research design for this study was after only control group non-equivalent quasi experimental design. After confirming their preoperative respiratory status as normal, out of sixty children, 30 children randomly assigned to control group and another 30 to the experimental group. Convenient sampling was followed for this study. The tool used for data collection was demographic profile, observational checklist to assess respiratory status and respiratory complications and a scoring procedure was also developed. Content validity of the tool was given by five experts in the field of paediatrics and two in the field of physiotherapy. Inter- rater reliability was used to check the reliability of the tool. Pilot study was done to check the feasibility of conducting the study. Data collection period was six weeks. Both descriptive and inferential statistics were used for the analysis of data. The following were the significant findings of the study. The postoperative respiratory status of the experimental group who had chest physiotherapy and incentive spirometry was significantly higher than the control group. ('t' value on fourth postoperative day was 5.59*). The respiratory complications of the experimental group who had chest physiotherapy and incentive spirometry were lesser than the control group. ('t' value on fifth postoperative day was 2.71*). The result of the study implies that the chest physiotherapy and incentive spirometry was very effective in children who had undergone abdominal surgery.

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INTRODUCTION

"I brought children into this dark world because
It needed the light that only a child can bring"

-Liz armbruster

BACKGROUND OF THE STUDY

"Children are the brightest treasures we bring forth into this world"

The wealth and strength of the nation depends on the children because they are the future leaders. But they become the victim of health problems during their developmental period. The process of invasive and surgical procedures is extremely hard on children. This stress period includes venipuncture, separation from parents at the time of transport to the operating room and anesthesia induction.

Children experiencing surgical procedures require both psychological and physical preparation. Even though children are asleep for the actual surgical intervention, they are subjected to numerous preoperative and postoperative procedures. Although most preoperative care procedures are routine, nurse should keep in mind that they could be anxiety provoking for children and parents.(Hockenberry, 2009).

Psychological intervention consisting of systematic preparation, rehearsal of the forthcoming events, and supportive care at each of these points has been shown to be more effective than a single session preparation or consistent supportive care without systematic preparation and rehearsal. Parental presence during induction of anaesthesia decreases the child's anxiety during induction (eg. Breath holding, laryngospasm) and decreasing long-term behavioural effects of surgery. (Romino et al., 2005).

Inspite of the scientifical and technological development, squeal after the diseases are still problematic and requires immediate attention. Various psychological and physical interventions and observations are required to prevent or minimize possible untoward effects from anesthesia and the surgical procedure. Managing pain is a major nursing responsibility after surgery. The nurse should assess pain frequently and administer analgesics to provide comfort and facilitate cooperation with postoperative care such as ambulation and deep breathing.(Warner, 2005).

Postoperative complications are defined as the unexpected disease that occurs either early or late that is connected with the exacerbation of a pre-existing illness. Postanesthesia complications such as airway obstruction, postextubation croup, laryngospasm and bronchospasm make maintaining a patent airway and maximum ventilation is crucial.(LuizJoia et al., 2005).

Many other postoperative complications can occur, but those involving the pulmonary tract are the most common complication and contribute to the peri-operative morbidity and mortality. Because respiratory complications are potential, every effort is taken to aerate the lungs and remove secretions. The lungs are auscultated regularly to identify abnormal sounds or any areas of diminished or absent breath sounds. To prevent hypostatic pneumonia, respiratory movement can be encouraged with incentive spirometer or other motivating activities. If these measures are presented as games, the child is more likely to comply. The child's position is changed every 2 hours, and deep breathing is encouraged. (Redmond, 2001).

Various studies have demonstrated that, upper abdominal surgery correlates more strongly with postoperative pulmonary complications. LuizJoiaNeto, et al., (2005) estimated that diaphragm dysfunction, postoperative pain and alveolar collapse result in a 50% to 60% decrease in vital capacity and a 30% decrease in residual functional capacity after abdominal surgeries. They also found that the most frequent postoperative pulmonary complications were pneumonia and the incidence was higher in the 0-11 age group.

Wong and Whaley (2008) suggest that the nurse plays a significant role in preparing the child for surgery, maintaining surveillance of the child during surgery, preventing complications and facilitating recovery. When preparing the child for surgery, it is important to realize that, no matter how mature the child may act, he or she still needs to be treated differently than adults. Some children show eagerness to discover, exactly what will happen to them in detail. Others do not want much detail. So the nurse has to implement her teaching or intervention before surgery in such a way keep in mind that the particular level of a child’s development will determine the specific concerns.

Miguel Mateu., (1998) posited that breathing exercises have commonly been used to increase pulmonary volume and improve gas exchange and ventilation distribution. Deep breathing exercises as well as incentive spirometrytechnique may reduce the surgically induced alterations such as decreased diaphragmatic mobility and abnormal pulmonary changes.

Breathing is an automatic function, but when a person has respiratory difficulties, breathing becomes more difficult. Breathing exercises helps the people to breathe easier. There are many benefits to breathing exercise. These exercises help to get more lung expansion and improve lung capacity. The diaphragm is also strengthened by breathing exercises. All types of exercise strengthen the muscles of diaphragm and chest capacity (Arruda et al., 2004).

Thoren reported that chest physiotherapy reduced the incidence of pulmonary complications after cholecystectomy, there has been an acceptance that patients undergoing abdominal surgery require some form of prophylactic physiotherapy. The nature of chest physiotherapy has varied according to prevailing attitudes about the pathophysiology of atelectasis. Attention has lately been directed towards lung expansion techniques such as incentive spirometry that promote frequent maximum inspiratory effort (Hall et al., 1991).

In their most acceptable and available form, incentive spirometers are disposable plastic devices that enable patients to observe the extent of their inspiratory effort. The expected benefits include the prevention of postoperative alveolar collapse, the convenience of controlled deep breathing exercise with little supervision and cheapness (Jeff Tapper et al., 1999).

SIGNIFICANCE AND NEED FOR THE STUDY

"To keep the body in good health is a duty,

otherwise we shall not be able to

Keep our mind strong and clear"

-Buddha.

Postoperative pulmonary complications contribute to surgical morbidity and mortality. Causes of complications are multifactorial and include patient related factors , surgery and anesthesia type. Pulmonary function testing has a limited role in preoperative assessment and chest x-ray and arterial blood gas measurement are rarely required.

It is estimated that at a minimum 2.5% of patients undergoing surgery may experience postoperative complication. This translates to as many as a million postoperative pulmonary complications of the 40 million patients undergoing non-thoracic surgery annually in North America. This figure may be as high as 25% to 30% among high risk patients undergoing major surgery (Peter rock 2006).

MC Alister(2005) said that the prediction ofpostoperative pulmonary complications is still in an under investigated field. He conducted a prospective cohort study, of 1055 consecutive patients 28(2.7%) suffered a postoperative pulmonary complications within 7 days of surgery: 13 patients developed respiratory failure requiring ventilator support, ten pneumonia, five atelectasis requiring bronchoscopic intervention and one pnemothorax, requiring intervention. Mean lengths of stay were substantially prolonged for these patients who developed pulmonary complications within seven days of surgery; 27.9 days versus 4.5days, p=0.006.

The number of pulmonary complications after major abdominal surgery increased globally between 1989 and 2004, according to a presentation at the society for Hospital medicine annual meeting (Laurie Barclay 2007.)

According to “National Hospital Discharge Survey” during 1989-2004, the estimated abdominal operations and postoperative pulmonary complications and the estimated number of major abdominal operations performed were 12,897,800. Postoperative pulmonary complications occurred after surgery in 388,400 men (7.8%) and in 452,800 women (5.7%).

High risk children should be examined for perioperative respiratory adverse events at the preoperative period, and the information gained there could be used to optimize anesthetic care. They might also benefit from specifically targeted anesthesia management (Becky McCall et al., 2010).

Beverly D. Delacruz et al., (2009) has done a study to develop guidelines and proposed a scoring system for pediatric risk stratification for postoperative pulmonary complications and to determine the accuracy of this simple and rapid pre-operative scoring system for postoperative pulmonary complications in pediatric patients undergoing elective surgery. The total samples included in this study were 506 children. Hospital medical records of children aged 6 to 19 years old, who underwent elective surgery were analyzed. Among the total samples, 330 (65.2%) developed post-operative complications while 176 (34.8%) with none. Atelectasis (25.6%) was the top complications.

The American College of Physicians (2006) recommended that all patients after preoperative evaluation are found to be at higher risk for postoperative pulmonary complications and therefore they should receive the following postoperative pulmonary complications: Deep breathing exercises or incentive spirometry or any other respiratory therapy.

Wallis and Prasad (1999) explained that physiotherapy is often prescribed after abdominal or cardiac surgery in an attempt to counter the negative pathophysiological changes that occur in the postoperative period. Adult patients undergoing upper abdominal surgery and stay in the hospital for upto 2 weeks, a degree of atelectasis is almost invariable. Children are even more predisposed to postoperative respiratory failure because of poorly developed intercostal muscles and a compliant chest wall but less compliant lungs and poorly established collateral alveolar collapse. Specific respiratory therapy techniques might have different effects on oxygen saturation and hemodynamic stability in different age groups and careful assessment should ensure that the intervention is beneficial and effective rather than hazardous.

Breathing exercise using incentive spirometer had been found to be effective in strengthening the respiratory muscles during postoperative period. Teaching patients about incentive spirometry exercise can maintain the respiratory status and can prevent respiratory complication due to abdominal surgery (Griffin et al., 2007).

Patient education and patient counseling are independent functions of a nurse. In addition, not so many studies are conducted on these aspects in south India. With this background and knowledge the researcher intended to study the effect of chest physiotherapy and incentive spirometry among children who had undergone abdominal surgery.

STATEMENT OF THE PROBLEM

A study to assess the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status and respiratory complications among children undergoing abdominal surgery in Government Rajaji Hospital at Madurai.

OBJECTIVES

- To determine the respiratory status of children preoperatively.
- To find out the postoperative respiratory status of children who had abdominal surgery after receiving chest physiotherapy and incentive spirometry.
- To evaluate the effectiveness of chest physiotherapy and incentive spirometry. on postoperative respiratory status of children who had abdominal surgery.
- To find out the postoperative respiratory complications of children who had abdominal surgery after receiving chest physiotherapy and incentive spirometry.
- To evaluate the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory complications of children who had abdominal surgery.
- To find out the association between posttest respiratory status of the children in

  Experimental group and their selected variables. (age, sex, type of surgery).
- To find out the association between posttest respiratory complication of the children in experimental group and their selected variables. (age, sex, type of surgery).

HYPOTHESES

All the hypotheses were tested at 0.05 level of significance:

- H_1-The mean respiratory status of the experimental group on 4thpost operative day who had chest physiotherapy and incentive spirometry will be significantly higher than their mean respiratory status on 1st postoperative day.

- ❖ H_2-The mean post-test respiratory status of the experimental group who had chest physiotherapy and incentive spirometry will be significantly higher than the mean posttest respiratory status of the control group.
- ❖ H_3-The postoperative respiratory complications of the experimental group who had chest physiotherapy and incentive spirometry will be significantly lower than the postoperative respiratory complications of control group.
- ❖ H_4-There will be significant association between postoperative respiratory status of the children who received chest physiotherapy and incentive spirometry& their selected variables. (age, sex, type of surgery).
- ❖ H_5-There will be significant association between postoperative respiratory complication of the children who received chest physiotherapy & their selected variables. (age, sex, type of surgery).

OPERATIONAL DEFINITION

Effectiveness:

It means that the way in which it produces the intended result. In this study, it is the statistical measure of the difference in the respiratory status and respiratory complications score obtained between the experimental group and control group after the administration of chest physiotherapy and incentive spirometry which is measured by observational checklist for respiratory status and respiratory complications.

Respiratory status:

Respiratory status is defined as the movement of air in and out of the lungs and exchange of carbon dioxide and oxygen at the alveolar level.

-Nursing outcome classification

Respiratory status is assessed by monitoring the patient for cough, sputum production, shortness of breath, orthopnea, tachypnea, and chest pain. The presence and quality of breath sounds are investigated. Other measures of pulmonary function include chest x-ray results, arterial blood gas values, pulse oximetry, and pulmonary function test results.

In this study**,** Respiratory status denotes the condition of the respiratory system as assessed by an observational checklist. It includes respiratory rate, pulse rate, temperature, chest retractions, unilateral expansion of chest, nasal flaring, air entry, shape of the chest, breath sounds, cough, wheezing, use of accessory muscles, dyspnea and discoloration of finger and lips.

Respiratory complications:

It is defined as an identifiable respiratory disease or dysfunction that is clinically relevant and adversely affects the clinical course.

In this study, Respiratory complications refer to those respiratory passage problems & lung problems that will decrease air entry due to effects of surgery. It includes atelectasis, pneumonia**,** pleural effusion, emphysema.

Atelectasis:

It is defined as a collapsed or airless state of the lung, which may be acute or chronic and may involve all or part of the lung.

In this study it refers to the characteristics such as fever, diminished respiratory movements, and diminished breath sounds, tracheal displacement toward affected side and X –ray features such as mediastinal shift or tracheal deviation.

Pneumonia:

It is defined as the inflammation of the lung with consolidation and exudation.

In this study it refers to the characteristics such as fever, tachypnea, cough, decreased breath sounds, intercostals retractions and x-ray features such as lobar consolidation or interstitial infiltrates.

Pleural effusion:

It is characterized by inflammation and exudation of serous fluid into the pleural cavity.

In this study it refers to the characteristics such as dyspnea on exertion, chest expansion reduced & limited diaphragm movement, frothy white or pink mucoid sputum and diminished breath sounds.

Emphysema:

It is defined as the abnormal presence of air in tissues or cavities of the body.

In this study it refers to the characteristics such as low grade fever, tachypnea, and pleuritic chest pain, dullness to percussion over effusion, diminished or absent breath sounds.

Chest physiotherapy:

Chest physiotherapy (CPT) is an airway clearance technique that combines manual percussion of the chest wall by the caregiver, strategic positioning of the patient for mucus drainage with cough and breathing techniques.

In this study chest physiotherapy comprises of postural drainage and various manipulative procedures like chest percussion, cough stimulation and deep breathing exercise through pursed lips and assisting with tactile sense.

Incentive Spirometry:

Incentive spirometryis a method of deep breathing that provides visual feedback to help the patient inhale slowly and deeply to maximize lung inflation.

In this study it refers to the process of inhaling deeply, holding the breath for three seconds and exhaling slowly with the help of spirometer.

Abdominal surgery:

Abdominal surgery is defined as surgery pertaining to the contents of the abdominal cavity, its walls & orifices. It includes the following planned surgeries like Appendicectomy, Herniotomy, Colostomy, Ureterolithotomy, Cholecystectomy, Laproscopic surgery, Herniorrhaphy.

Appendicectomy:

It refers to the surgical excision of vermiform appendix.

Herniotomy:

It is defined as an operation to remove a hernial sac.

Colostomy:

An artificial opening (stoma) in the large intestine brought to the surface of the abdomen for the purpose of evacuating the bowel.

Ureterolithotomy:

Surgical removal of a calculus lodged in a ureter.

Cholecystectomy:

It refers to the excision of gall bladder.

Laparoscopic surgery:

It is defined as the type of surgery viewing the abdominal cavity by passing an endoscope through the abdominal wall by making one or more incisions.

Herniorrhaphy:

It is defined as the removal of a hernia sac and repair of the abdominal wall.

ASSUMPTIONS

- Every child is unique and responds in unique manner in response to chest physiotherapy and incentive spirometry.

- Chest physiotherapy and incentive spirometry is a part of nursing activity in the post-operative period.
- Chest physiotherapy and incentive spirometry increases pulmonary volume, improves gas exchange and ventilation distribution.
- Chest physiotherapy and incentive spirometry helps to get more air into the lungs and improves lung capacity.

DELIMITATION

The following delimitations are set for the study,

- Children between the age group of 3-12 years, who are admitted in GovernmentRajajiHospital in Madurai.
- Children undergoing abdominal surgery during the period of data collection.
- Study is confirmed to Tamil/English speaking children.

PROJECTED OUTCOME

- The study findings will determine the effectiveness of chest physiotherapy and incentive spirometry in reducing postoperative respiratory complications.
- The study findings will help the nursing personnel to select the breathing intervention in reducing postoperative respiratory complications.
- It will help the health personnel to conduct further research studies in chest physiotherapy and incentive spirometry to prevent respiratory complications.

CONCEPTUAL FRAMEWORK

Conceptual framework represents a less formal attempt at organizing phenomena. Conceptual model deal with concepts that are assembled by virtue of their of relevance to a common theme.

The conceptual framework of this study is based on, “J.W.Kenny’s open system model”. The model consists of 3 components.

- Input
- Process
- Output

All the systems are open; there is a continued exchange of matter, energy & information.Open system receives varying degrees of interaction with the environment, from which the system receives input & gives feedback, output in the form of matter, energy & information for survival, systems must receive varying types of matter, energy & information.

Input:

It refers to energy or information that enters into the system through its boundary.

Process:

It refers to transformation, which enables the input to be transformed in such a way that it can be used readily by the system.

Output:

It refers to the energy in formats or matter that is transformed to the environment.

In this study, input is chest physiotherapy and incentive spirometry to children undergoing abdominal surgeries only for experimental group.

The output will be reduction in postoperative respiratory complications among children undergoing abdominal surgery in the experimental group.

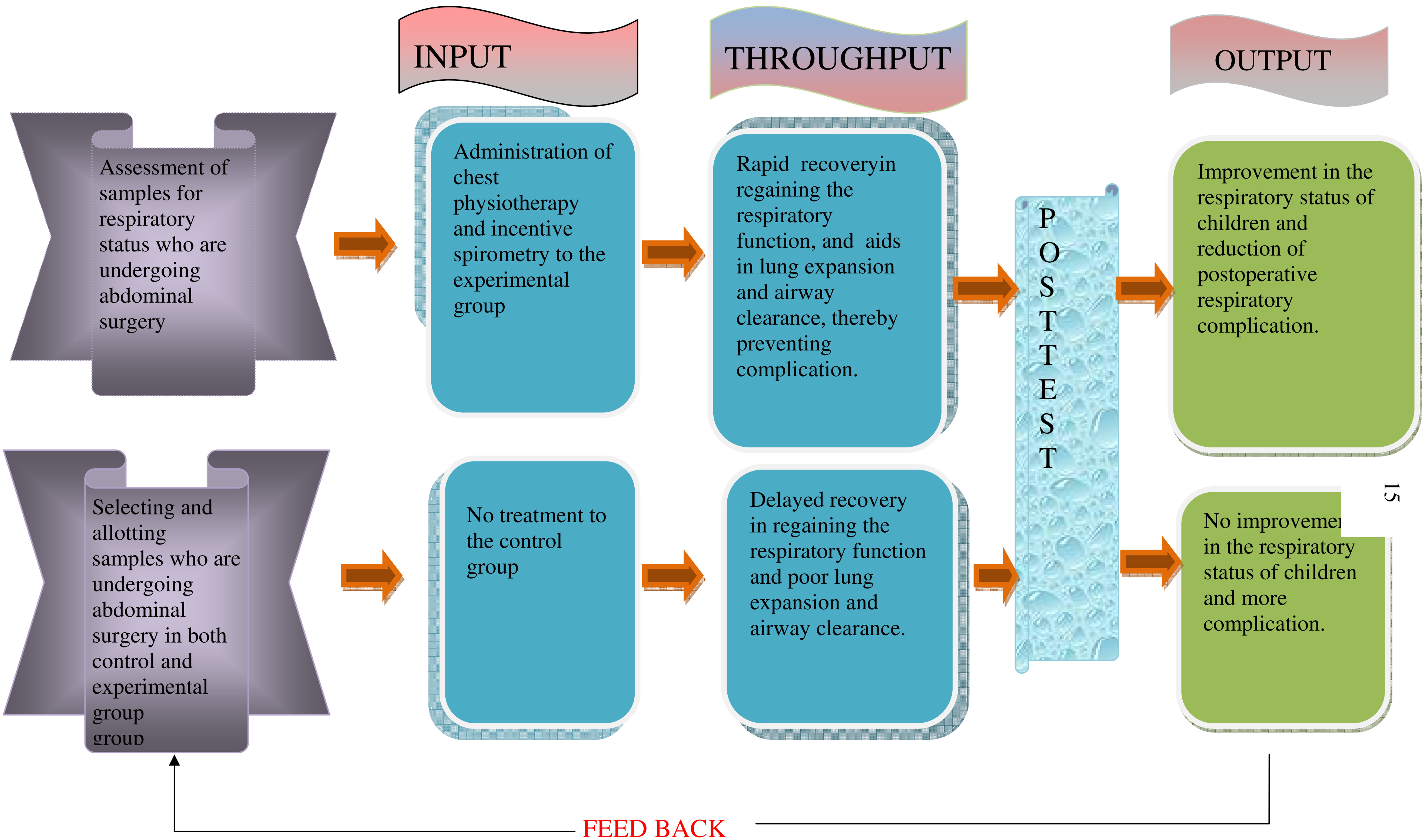

FIGURE 1: CONCEPTUAL FRAME WORK BASED ON J.W. KENNY'S OPEN SYSTEM MODEL

CHAPTER II

REVIEW OF LITERATURE

According to Polit and Hungler (1999) the task of reviewing research literature involves the task of reviewing research literature involves the identification, selection, critical analysis and written description of existing information on the topic. Related literature which was reviewed is discussed under the following headings.

1. Studies related to overview of the postoperative pulmonary complications.
2. Studies related to chest physiotherapy and incentive spirometry.

Studies related to overview of postoperative pulmonary complications

Soledad Chumillas (1998) posited that pulmonary function is commonly altered after surgery, particularly in patients who have had chest or upper abdominal surgery. The physiological changes observed are directly related to anaesthesia (general or regional) and to the type of incision and surgical technique employed, and are reflected by decreases in total pulmonary capacity and pulmonary volumes and by a parallel decrease in Pa02.

Yoder (2009) said that thoracic and upper abdominal surgery is associated with a reduction in vital capacity by 50% and in functional residual capacity by 30%. Diaphragmatic dysfunction, postoperative pain, and splinting make these changes. After upper abdominal surgery, patients shift to a breathing pattern with which ribcage excursions and abdominal expiratory muscle activities increase. Postoperative patients maintain adequate minute volume, but the tidal volume is very low and the respiratory rate increases. These abnormal breathing patterns, along with the residual effects of anesthesia and postoperative analgesics, inhibit cough, impair mucociliary clearance, and contribute to the risk of postoperative pulmonary complications.

David Warner (2005) described that many factors responsible for PPCs are related to disruption of the normal activity of the respiratory muscles, disruption that begins with the induction of anaesthesia and that may continue into the postoperative period. The effects of anaesthesia can persist into the postoperative period, though via different mechanisms, as the effects of surgical trauma come into play. These are most pronounced following thoracic and abdominal surgery, and arise from at least three mechanisms. First, functional disruption of respiratory muscles by incisions, even after surgical repair, may impair their effectiveness. Postoperative pain may cause voluntary limitation of respiratory function. Finally, stimulation of the viscera, such as provided by mechanical traction on the gallbladder or esophageal dilation, markedly decreases phrenic motor neurone output and changes the activation of other respiratory muscles, in general acting to minimize diaphragmatic descent. Other factors that may contribute to PPCs include:

1. Reflex stimulation during surgery, and release of inflammatory mediators by drug administration, increasing airway resistance and limiting expiratory gas flow from the lung; if severe this can produce hyperinflation with risk of barotrauma and gas exchange abnormalities.
2. Impairment of normal mucociliary transport by anaesthetic gasses and endotracheal intubation which may delay clearance of pathogens and promote retained secretions
3. Impairment of lung inflammatory cell's function by prolonged anaesthesia and surgery, which could increase susceptibility to postoperative infections

4. Impaired upper airway reflexes postoperatively, with may increase the risk of aspiration, and
5. Incomplete reversal of neuromuscular blockade.

Rochelle Wynne and Mari Botti (2004) postulated that the pathogenesis of postoperative pulmonary dysfunction is associated with anomalies in gas exchange, alterations in lung mechanics, or both. Abnormalities in gas exchange are evidenced by a widening of the alveolar-arterial oxygen gradient, increased micro vascular permeability in the lung, increased pulmonary vascular resistance, increased pulmonary shunt fraction, and intrapulmonary aggregation of leukocytes and platelets. Variations in the mechanical properties of the lung lead to reductions in vital capacity, functional residual capacity, and static and dynamic lung compliance.

Woerlee (2009) listed certain performance criteria for the respiratory system of a surgical patient. They are:

- The lungs must have sufficient oxygen to oxygenate the blood.
- The pulmonary circulation must eliminate carbon dioxide from the body to prevent carbon dioxide accumulation.
- The client must be able to generate a productive cough; otherwise mucus accumulation will occur resulting in atelectasis and/or lung infection or pneumonia.
- The client must be able to significantly increase their respiratory minute volume to compensate for factors such as increased postoperative metabolic rate, elevated body temperature, possible infections, pneumonia, etc. Poor performance in significantly raising and sustaining an elevated respiratory minute volume results in exhaustion and respiratory failure.

Postoperative pulmonary complications account for a substantial portion of the risks related to surgery and anaesthesia and are a source of postoperative morbidity, mortality and longer hospital stays. The current basis for our understanding of the nature of Postoperative pulmonary complications is weak; only a small number of high quality studies are available, a uniform definition has not emerged, and studies have focused on specific patients and kinds of surgeries. Current evidence suggests that risk factors for Postoperative pulmonary complications are related to the patient's health status and the particular anaesthetic and surgical procedures chosen. Age, pre-existing respiratory and cardiac diseases, the use of general anaesthesia and overall surgical insult are the most significant factors associated with complications. Election of anaesthetic technique, postoperative analgesia and chest physiotherapy seem to be the preventive measures that are best supported by evidence. (J.Canet, V.Mazo, 2010).

J.C.Hall et al. (1991) evaluated the relationship between postoperative pulmonary complications and various putative risk factors in a prospective longitudinal study of 1000 patients undergoing abdominal surgery. Transient subclinical events were studied by defining postoperative pulmonary complications as positive clinical findings in combination with either positive sputum microbiology, unexplained pyrexia, or positive chest roentgenographic findings. The overall incidence of postoperative pulmonary complications was 23.2 %(232/1000). These findings supplies clinicians and clinical nurse with a simple means of identifying patients who are at high risk of postoperative pulmonary complications after abdominal surgery.

Postoperative pulmonary complications contribute significantly to the overall perioperative morbidity and mortality. Pulmonary complications occur significantly more often in patients undergoing elective surgery of the thorax and abdomen. These include atelectasis, infections including bronchitis and pneumonia, respiratory failure and bronchospasm. Sharma (2000).

The study findings of Brooks-Brunn (1995) revealed that atelectasis and infectious complications account for the majority of reported pulmonary complications. Risk factors were thought to exaggerate pulmonary function deterioration, which occurred both during and after surgical procedures. 18 risk factors were reviewed regarding their Pathophysiology, impact on preoperative, intra operative and postoperative pulmonary function in this study. Identification of risk factor and prediction of postoperative pulmonary complications are important. Preoperative assessment and identification of patients at risk for postoperative pulmonary complications can guide our respiratory care to prevent or minimize these complications.

Postoperative pulmonary complications were investigated in a total of 41 paediatric recipients who underwent orthotopic liver transplantation. Atelectasis was seen in 40 cases (98%) of the 41 recipients, and occurred in the left lower lobe in 28 cases (68%), and in the right upper lobe in 25 cases (61%). Radiographic pulmonary edema occurred on 23 occasions in 18 recipients (45%). Five recipients experienced two episodes of pulmonary edema during their ICU stay. Pleural effusions were observed in 21 cases (52%), of which 18 had right sided effusion and 3 had bilateral effusions. Pneumothorax occurred in 3 cases. Pyothorax, hemothorax, bronchial asthma and subglottic granulation occurred in one case each. The present study demonstrated that postoperative pulmonary complications are frequently observed in paediatric recipients undergoing orthotopic liver transplantation. (Toshihide et.al., 1994).

Kanat et al., (2007) studied the risk factors for postoperative pulmonary complications in upper abdominal surgery. They concluded that pulmonary complications are the most frequent causes of postoperative morbidity and mortality in upper abdominal surgery. A prospective study on 60 consecutive patients was conducted who underwent elective upper abdominal surgery in general surgical unit. Each patient's preoperative pulmonary status was assessed by an experienced chest physician using clinical examination, chest radiographs, spirometry, blood analysis, anaesthetical risks, surgical indications, operation time, incision type, duration of nasogastric catheter and mobilization time. Complications were observed in 35 patients (58.3%). The most complications were pneumonia followed by pneumonitis, atelectasis, bronchitis, pulmonary emboli and acute respiratory failure. They recommend a detailed pulmonary examinations and spirometry in patients who will undergo upper abdominal surgery by chest physicians to identify the patients at high risk for postoperative pulmonary complications, to manage respiratory problems of the patients before surgery and also to help surgeons to take early measures in such patients before a most likely postoperative pulmonary complications occurrence.

Serojo et al., (2007) in a prospective cohort study, studied risk factors for pulmonary complications after emergency abdominal surgery. Pertinent data were collected through interview and chart review and their association with the occurrence of postoperative pulmonary complications were analyzed. 286

consecutive children were included and 75 (28.2%) developed postoperative pulmonary complications. Pulmonary complications are frequent among children undergoing abdominal surgery and lead to increased length of hospital stay and death rate.

Kilpadi, et al., (1999) in a prospective study of respiratory complications, conducted a study for a period of six months with total samples of 584 patients, who underwent elective or emergency surgery. He found that 81 of them had 13.9% of respiratory complications, 68% had pneumonia and others included pleural effusion, empyema and exacerbation of asthma.

Felardo et al., (2002) investigated the postoperative pulmonary complications after upper abdominal surgery. Two hundred and eighty three patients were followed from pre to postoperative period. A protocol including a questionnaire, physical examination, thoracic radiogram and spirometry was used during preoperative period. Sixty nine (24.4%) patients had pulmonary complications in 87 events registered. Pneumonia was the most frequent event 34% (30/87) followed by atelectasis 24% (21/87), broncho constriction 17% (15/87), acute respiratory failure 13% (11/87), prolonged mechanical ventilation 9% (8/87) and bronchial infection 2% (2/87).

Pulmonary complications occur more frequently than cardiac complications. The complication rates for upper abdominal and thoracic surgery are the highest. A better understanding of the risk factors associated with postoperative pulmonary complications is essential to develop strategies for reducing these complications. In any individual patient the benefit from a surgical procedure should be weighed against the risks it imposes. When possible, stabilization of respiratory status is advisable before surgery. (Muhammed Aslam, Syed Hussain, 2005).

Decline in pulmonary function after major abdominal surgery is thought to be identified in daily assessment by observation of breathing and pain intensity. Measurement of pulmonary function is usually not included in the assessment of the patient in postoperative period. The aim of this study was to investigate the relationship between clinical observation of breathing and decline in pulmonary function and pain. Eighty nine patients admitted for elective major, mild and upper abdominal surgery, participated in the study. Clinical observation of breathing covered the following parameters like abdominal expansion, side expansion, high thoracic expansion, paradoxical breathing, symmetry of thorax expansion, ability to huff and signs of mucus retention. Pain intensity was assessed at rest and during breathing exercises and during coughing using a visual analogue scale. Peak expiratory flow rate were performed on the preoperative day and for seven postoperative days. A poor correlation is found between clinical observation of breathing and pulmonary function after abdominal surgery. (Johannes vandeleor et al., 2003).

Fung et al., (2010) compared postoperative respiratory complications in obese and nonobese children following surgery for sleep-disordered breathing. All obese children who had undergone adenotonsillectomy for sleep-disordered breathing from 2002 to 2007 were compared with age- and gender-matched controls. Length of hospital stay and the incidence, severity, and location of respiratory complications were compared. Forty-nine obese children were identified (20:29, female: male). Overall, 37 obese children (75.5%) and 13 controls (26.5%) incurred complications (P = 0.000). Ten obese patients and two controls incurred major events (P = 0.012);

36 obese children had minor complications versus 12 controls (P = 0.000). Obese children had significantly more upper airway obstruction (19 vs. 4, P = 0.0003), particularly during the immediate postoperative period. The mean hospital stay was significantly longer for the obese group (18 vs. 8 hours, P = 0.000, mean difference of 10 hours). He concluded that Obesity in children significantly increases the risk of respiratory complications following surgery for sleep-disordered breathing.

Sixty patients were studied to determine the incidence of postoperative pulmonary complications and the value of preoperative spirometry in producing pulmonary complications after upper abdominal surgery. On the day before the operation and for 15 days after the operation, each patient's respiratory status was assessed by clinical examinations, chest x-ray, spirometry and blood gas analysis. A chest physician and surgeon monitored patients for pulmonary complications independently. In this study postoperative pulmonary complications developed in 21(35%) patients (pneumonia in 10 patient, bronchitis in 9 patients, atelectasis in 1 patient, pulmonary embolism in 1 patient) of 31 patients with abnormal preoperative spirometry, 14 patients showed normal preoperative spirometry, 7 patients showed complications. It was concluded that postoperative pulmonary complications was still a serious cause of postoperative morbidity. (Kocabas et al., 1996).

Study conducted by Ephgrave et al., (1993) revealed that postoperative pneumonia was a major complication that had been linked to micro aspiration of pathogens originating in the gastrointestinal tract. 140 patients who had undergone major surgeries were selected. Postoperative pneumonia is present in 26 (18.6%) of 140 patients. Postoperative pneumonia is a morbid postoperative complications associated with presence of gastric bacteria during operation and transmission of gastric bacteria to the pulmonary tree after surgery.

Studies related to chest physiotherapy and incentive spirometry

Chest physiotherapy is an important therapy in the treatment of respiratory illness. It is very important to carry out this procedure in children for the purpose of loosening secretions from the lungs.

Morran, et al., (1993) has done a randomized controlled trial on physiotherapy for postoperative pulmonary complications. A sample size of 102 patients undergoing cholecystectomy was assigned to control group and study group. The patients in the control group did not receive chest physiotherapy, while patients in the study group received chest physiotherapy. The study proved that without chest physiotherapy 21 patients developed atelectasis and 19 patients developed chest infections whereas with chest physiotherapy 15 patients developed atelectasis and 7 developed chest infection and 40 patients developed no complication. The author concluded that routine prophylactic chest physiotherapy significantly decreased frequency of chest infection ($p<0.02$).

Lie, C et al., (1999) had written that postoperative pulmonary complications play a significant role in the postoperative morbidity after abdominal surgery. To prevent this, an array of methods, such as chest physiotherapy, incentive spirometry or mask treatment with positive airway pressure are used. He stated that the available controlled studies indicate that none of these treatment modalities reduced the occurrence of postoperative atelectasis but only chest physiotherapy is able to reduce the development of postoperative pneumonia. He recommends chest physiotherapy as prophylactic treatment after abdominal surgery.

Manzano et al., (2008) conducted randomized clinical trial on chest physiotherapy during immediate postoperative period among patients undergoing upper abdominal surgery in the post-anesthesia care unit of a public university hospital. 31 patients were randomly assigned to control (n=16) and chest physiotherapy (n=15) groups. The chest physiotherapy group received treatment at the post-anaesthesia care unit, while the control did not. The control groups presented decreased spirometry values in contrast the chest physiotherapy group presented improved oxygen-hemoglobin saturation during the immediate postoperative period ($p<0.03$). He concluded that chest physiotherapy was very effective in improving the 0xy-hemoglobin saturation during the immediate postoperative period. Breathing exercises could be adopted at post-anaesthesia care units with benefits for patients.

Fagevikolsen, et al., (2005), conducted a randomized controlled study to evaluate the clinical benefit and physiological effects of prophylactic chest physiotherapy in open major abdominal surgery. A group of 174 patients received chest physiotherapy including breathing with pursed lips, huffing and coughing, and information about the importance of early mobilization. In addition high-risk patients were given resistance training on inspiration and expiration with a mask. The resistance used during inspiration was −5 cmH_2O and that during expiration +10 cmH_2O. The control group (194 patients) received no information or treatment unless a pulmonary complication occurred. The result showed that oxygen saturation on postoperative days 1–3 was significantly greater in the treatment group. Treated patients were mobilized significantly earlier. No difference was noted in peak expiratory flow rate or forced vital capacity. Postoperative pulmonary complications occurred in 6 per cent of patients in the treatment group and in 27 per cent of controls (*P*<0·001). In high-risk patients the numbers with pulmonary complications were six of 40 and 20 of 39 respectively. Pulmonary complications were particularly common in patients with morbid obesity. This study showed that, preoperative chest physiotherapy reduced the incidence of postoperative pulmonary complications and improved mobilization and oxygen saturation after major abdominal surgery.

Warren and Grim Wood (1996) conducted a study on postoperative pulmonary complications in patients who underwent cholecystectomy. In this study 194 patients were included. Postoperative pulmonary complications such as atelectasis and pneumonia developed in 42 patients. Patients receiving physiotherapy had substantially fewer pulmonary complications complications. So from this study, we can conclude that, patients receiving chest physiotherapy are prone to develop fewer pulmonary complications.

The effectiveness of incentive spirometry versus chest physiotherapy for prevention of postoperative pulmonary complications was investigated after abdominal surgery. The researcher entered 876 patients into a clinical trial aimed at preventing pulmonary complications after abdominal surgery. Patients either received conventional chest physiotherapy or were encouraged to perform maximal inspiratory manoeuvres for 5 min during each hour while awake, using an incentive spirometer. The incidence of pulmonary complications did not differ significantly between the groups: incentive spirometry 68 of 431 (15·8%, 95% Cl 14·0-17·6%), and chest physiotherapy 68 of 445 (15·3%, Cl 13·6-17·0%). Nor was there a difference between the groups in the incidence of positive clinical signs, pyrexia, abnormal chest radiographs, pathogens in sputum, respiratory failure ($PO2 < 60$ mm

Hg), or length of stay in hospital. They concluded that prophylactic incentive spirometry and chest physiotherapy are of equivalent clinical efficacy in the general management of patients undergoing abdominal surgery. (Hall et al., 1996).

Spirometry is one of the most common pulmonary lung function tests and it also a lung expansion technique. It is used to test for a variety of lung problems and to determine the effectiveness of treatment. The patient takes a deep breath and breaths out with force into a spirometer to the best of their ability. The spirometer measures both the amount of air expelled and how quickly the air was expelled from the lungs.

Controversy exists with the routine use of aids to lung expansion in the prevention of pulmonary complications after abdominal surgery. The researcher prospectively randomized 172 patients into 1 of 4 groups: the control group (44 patients) received no respiratory treatment, the IPPB group (45 patients) received intermittent positive pressure breathing therapy for 15 min 4 times daily, the IS group (42 patients) were treated with incentive spirometry 4 times daily, and the DBE group (41 patients) carried out deep breathing exercises under supervision for 15 min 4 times daily. Postoperative pulmonary complications were defined as the development of 3 or more of 6 new findings: cough, phlegm, dyspnea, chest pain, temperature greater than 38 degrees C, pulse rate more than 100 beats/min. The frequency of development of pulmonary complications was 48% in the control group, 22% in the IPPB group (p less than 0.05), 21% in the IS group (p less than 0.05), and 22% in the DBE group (p less than 0.05). Side effects of respiratory treatment were observed only in the IPPB group (18%; p less than 0.05). This difference was not observed for the other two treatment groups. (Celli et al., 1984).

An ineffective cough leads on to retention of secretions, decreased lung compliance and atelectasis. The collapsed regions of lungs that are not reinflated can get infected. Incentive spirometry is a commonly used, effective and inexpensive bronchial hygiene tool for lung expansion. A lung expansion technique is one that increases lung volume above that of usual unassisted inspiration. Lung expansion techniques are indicated to prevent atelectasis or pneumonia in patient who cannot or will not perform periodic hyperinflation, like postoperative patients with thoracic or abdominal surgery, patients with obstructive pulmonary disease, neuromuscular or chest wall disorders. (Naveen Malhotra et al., 2007).

Prevention of respiratory complications after abdominal surgery was investigated by conducting a randomised clinical trial by a comparison of a global policy of incentive spirometry with a regimen consisting of deep breathing exercises for low risk patients and incentive spirometry plus physiotherapy for high risk patients. Stratified randomised trial was undertaken in a general surgical service of an urban teaching hospital.c456 patients undergoing abdominal surgery were included. The researcher defined respiratory complications as clinical features consistent with collapse or consolidation, a temperature above 38°C, plus either confirmatory chest radiology or positive results on sputum microbiology. He also recorded the time that staff devoted to prophylactic respiratory therapy. There was good baseline equivalence between the groups. The incidence of respiratory complications was 15% (35/231) for patients in the incentive spirometry group and 12% (28/225) for patients in the mixed therapy group (P=0.40; 95% confidence interval -3.6% to 9.0%). It required similar amounts of staff time to provide incentive spirometry and deep breathing exercises for low risk patients. The inclusion of chest physiotherapy for high risk patients, however, resulted in the utilisation of an extra 30 minutes of staff time per patient. He concluded that when the use of resources is taken into account, the most efficient regimen of prophylaxis against respiratory complications after abdominal surgery is deep breathing exercises for low risk patients and incentive spirometry for high risk patients. (Hall et al., 1996).

Pankaj Kundra et al., (2010) conducted a study that was designed to compare the effects of preoperative and postoperative incentive spirometry on lung functions after laproscopic cholecystectomy in 50 patients. Patients were randomized into a control group (n=25) and a study group (n=25). Patients in study group were instructed to carry out incentive spirometry before the surgery 15 times, every fourth hourly, for 1 week whereas in control group, incentive spirometry was carried out during the postoperative period. Lung functions were recorded at the time of preanesthetic assessment, on the day before the surgery, postoperatively at 6, 24 and 48 hours, and at discharge. Significant improvement in the lung functions was seen after preoperative incentive spirometry (study group, $p<0.05$). The lung functions were significantly reduced till discharge in both the groups. However, lung functions were better preserved in study group at all times when compared with control group $p<0.05$. He concluded that, lung functions are better preserved with preoperative than postoperative incentive spirometry.

Chest physiotherapy aims to decrease the occurrence of the postoperative pulmonary complications and hasten recovery. Breathing exercises aimed at maximising inspiratory effort are the most beneficial for the patients. In a non-randomised pilot study of 263 patients, it has been found that the addition of the incentive spirometer, as part of an intensive postoperative physiotherapy programme, decreased the occurrence of pulmonary complications (6vs 17%, $p=0.01$) and length of stay on the surgical figh dependency unit (3.1 vs 4 days p=0.03). The two groups were comparable when age, sex and the need for emergency surgery postoperative analgesia were compared. (Westwood et al., 2007)

CHAPTER-III

RESEARCH METHODOLOGY

Research methodology provides a brief description of the method adopted by the investigator in the study. Research methodology includes research approaches, research design, the setting, the population, sample, sample size, sampling technique & criteria for sample selection description of the tools validity, reliability, pilot study & data gathering process, plan for data analysis & the protection of human subjects.

RESEARCH APPROACH

Quasi-experimental approach was used for the present study. Quasi experiments involve the manipulation of an independent variable that is, the institution of a treatment. Quasi-experiments however either lack the randomization or control group feature that characterizes true experiment. The study aimed at evaluating the effectiveness of intervention package on reduction of respiratory complications. Random selection & randomization is not possible since it is impossible to have the entire listing of surgical clients, hence the researcher choose Quasi-experimental design.

RESEARCH DESIGN

Research design for this study is after only non-equivalent control group quasi-experimental design.

Diagrammatic representation of the design is given below

Experimental group	**:**	**X O1 XY O2 XY O3 XY O4 XY O5**
Control group	**:**	**O1 O2 O3 O4 O5**

01 - Observation of respiratory status on first postoperative day.

X -Manipulation of independent variable (incentive spirometry)

Y -Manipulation of independent variable (chest physiotherapy)

O2- O4 -Observation of respiratory status post-operatively for 3 consecutive days.

O5 -Observation of postoperative respiratory complications.

RESEARCH VARIABLES

Dependent variables: Postoperative respiratory status and respiratory complications.

Independent variables: Chest physiotherapy and incentive spirometry.

SETTING OF THE STUDY

The study was conducted in Government Rajaji Hospital, Madurai which is situated at Goripalayam. Data was collected from pediatric surgical ward. 75 beds are allotted for surgical unit. As an average 30 patients are admitted every week.

STUDY POPULATION

The study population were the children who have undergone for major abdominal surgery in Government Rajaji hospital at Madurai.

SAMPLE

In this study, the number of samples are 60 children those who were admitted in pediatric surgical ward for major abdominal surgery.

SAMPLING SIZE

The total sample size was 60, out of which 30 samples for experimental group & 30 samples for control group.

SAMPLING TECHNIQUE

Convenient sampling technique was followed for sample selection. The sampling units were selected simply because they were available – they were in the right place at the right time – that was convenient for the researcher.

CRITERIA FOR SELECTION OF SAMPLE

Inclusion criteria:

The samples were selected based on the following criteria.

- Children who underwent abdominal surgery from government Rajaji hospital, Madurai during the data collection period.
- Both male & female between the age group of 3-12 years.
- Children who spoke & understood Tamil or English.
- Children who were undergoing elective surgery.
- Children who were having normal respiratory status preoperatively.

Exclusion criteria:

- Children who were unconscious.
- Children who were critically ill.
- Children who were unwilling to participate.

RESEARCH TOOL AND TECHNIQUE

The tools used for this study consists of demographic data and observational checklist regarding the assessment of postoperative respiratory status and respiratory complications. The tool was prepared after going through related literature and with the guidance of experts in the field.

DESCRIPTION OF THE TOOL

The data collection tool consists of:

Part I : Demographic data (Appendix IV)

Part II : Observational checklist for assessment of respiratory status (Appendix V)

Part III : Observational checklist for respiratory complications. (Appendix VI)

Part I:

Part I consists of personal data of the client, which includes name, age, sex, hospital number, ward, diagnosis, type of surgery and date of surgery.

Part II:

The observational checklist consists of 14 items (respiratory rate, pulse rate, temperature, chest retractions, use of accessory muscles, nasal flaring, cough, wheezing, air entry, shape of the chest, dyspnea, expansion of the chest, breath sounds and discoloration of finger and lips.) for assessing respiratory status. The checklist consists of normal & abnormal respiratory characteristics. A score of 1 was allotted for each normal characteristics & a score of 2 was allotted for each abnormal characteristic feature. Higher the score indicates altered respiratory status and higher is the risk of developing respiratory complications.

Scoring interpretation:

Score

1-14 : Normal respiratory status

15-28 : Altered respiratory status

Part III:

The observational checklist consists of respiratory characteristics like Fever, diminished respiratory movements, diminished breath sounds, tracheal displacement toward affected side, tachypnea, cough , intercostals retractions, dyspnea on exertion, chest expansion reduced & diaphragm movement is limited, frothy white or pink mucoid sputum, pleuritic chest pain, dullness to percussion over effusion and x-ray features for assessing respiratory complications. The checklist consists of abnormal respiratory characteristics. A score of one (1) was allotted for presence of each finding & a score of zero (0) for absent findings. Higher the score, higher the respiratory complications.

Scoring interpretation:

Score

0 – No complication

1-4 – complications present.

TESTING OF THE TOOL

Validity

The tool was given to 2 experts in the field of pediatric surgery & three experts in the field of child health nursing & 2 experts in the field of physiotherapy. With their suggestions the validity of tool was confirmed.

Reliability

The reliability of measuring the tool was a major criterion in assessing the accuracy. The reliability of the check list to assess respiratory status and respiratory complications is established by inter rater reliability and the R value is 0.912 and 0.926 respectively.

Testing of the physiological tools

Evaluation of physiological measures requires a slightly different perspective from that of behavioral measures. Gift and Soe ken in 1998 as cited by burns 2001 identified the following terms as critical to the evaluation of physiological measures, accuracy, selectivity, precision and error.

Precision

Precision is the degree of consistency or reproductability of measurement made with physiological instrument. It is comparable to reliability.

To find out the precision of the thermometer, temperature was taken for seven patients. The reading of each patient was measured by researcher and her colleague simultaneously for the same patients immediately. Obtained values of the researcher and colleague were correlated. It was found to be correlating with each other and ‘r’ value is 0.96.

Error

Sources of error in physiological measures can be grouped into environment, user, subject, machine and interpretation (Burns, 2001). The instrument was given to the biomedical department and got no error certificate before the use.

Selectivity

It is the ability to identify correctly the signal under and to distinguish from other signal (Gift and Soeken, 1998 as cited by Burns, 2001).

The instrument used in the present study has selectivity for the dimensions which are to be studied. The volume spirometry was selected for forced inspiratory volume, vital capacity etc…

INTERVENTION:

CHEST PHYSIOTHERAPY

Definition:

Chest physiotherapy (CPT) is a method used to mobilize or loose secretions in the lungs and respiratory tract.

It usually refers to the use of postural drainage in combination with adjunctive techniques that are thought to enhance the clearance of mucus from the airway.

Along with the postural drainage the adjunctive techniques used in this study, consists of various manipulative procedures like chest percussion, cough stimulation and deep breathing exercise through pursed lips and assisting with tactile sense.

Purpose:

- To mobilize secretions and facilitate effective airway clearance.

Equipments:

- ✓ pillows for patient comfort
- ✓ stethoscope
- ✓ towel
- ✓ gloves
- ✓ Collection container for sputum.

Preliminary assessment for chest physiotherapy:

The following are the assessment criteria:

- ✓ Monitor vital signs.
- ✓ Collect the child's medication history, particularly diuretics and antihypertensive cause fluid and hemodynamic changes. These decrease child's tolerance to positional changes and postural drainage.
- ✓ Collect the child's medical history; certain conditions with increased ICP and spinal cord injuries, contra indicate the positional change to postural drainage.
- ✓ Know the child's cognitive level of functioning.
- ✓ Beware of child's exercise tolerance.

Procedure:

1. If the child and family are not familiar with chest physiotherapy, explain the procedure to them using developmentally appropriate language.
2. To provide a basis for determining response to the treatment, assess the child's baseline respiratory status before beginning the procedure. Before the treatment, ask the child to cough or suction the trachea to remove secretions that may have accumulated in the trachea.
3. The child should be dressed in lightweight shirt or gown covering the chest.
4. Place the child in a ***postural drainage*** position.
5. ***Percussion***: Gently but firmly clap the chest wall with cupped hands. A "popping", hollow sound should be the result, not a slapping sound.
6. ***Cough stimulation***: Child can be asked to cough. The child should be advised to cough out while the hand of the operator reinforces anticipated cough by synchronously compressing the lower half of the chest.
7. Collect the sputum in a container.

8. ***Deep breathing***: Encourage the child to take deep breathe through *pursed lips*. Inhale through the nose while counting to 3, then purse the lips as like blowing a whistle and then asked to breathe out gently through pursed lips for 6 counts.
9. *Assisting with tactile sense*: Place the hand over the child's chest where the muscular movement is desired and the child is encouraged to concentrate on expanding that part of chest under the placed hand.
10. Expiration after these deep breaths will often stimulate coughing. Assist with removal of secretions if needed.
11. Reposition the child as needed to complete the procedure, maintaining each position for approximately 5 to 10 minutes.

INCENTIVE SPIROMETRY EXERCISE

Incentive spirometry:

Incentive devices use the principle of sustained maximal inspiration (SMI) and incentive spirometry is a technique used to encourage the patient to take a maximal inspiration and to measure a flow or volume. A maximal inspiration sustained over three seconds may increase the transpulmonary pressure thereby improving inspiratory volumes and inspiratory muscle performance. When the procedure is repeated on a regular basis,
airway patency may be maintained and lung atelectasis prevented and reversed.

Incentive spirometry approximately resembles to natural sighing or yawning thereby encourages the patient to take long, slow, deep breaths. It is fulfilled by the use of incentive spirometer which helps the children to visualize and gives
positive reinforcement which also act as a form of play.

Definition:

An incentive spirometer is a device which measures deep breaths that expand lungs & helps to prevent pulmonary complications after surgery.

Procedure:

1. Assemble Incentive spirometer unit:
    - Remove all parts from plastic bag.
    - Attach mouthpiece to one end of wide-boring tubing and attach other end of tubing to large bore fittings on spirometer.
2. Explain the procedure to the child according to the level of understanding.
3. Sit on the edge of the bed if possible, or sit up as far as the child can in bed.
4. With the unit in an upright position, exhale normally & then place the lips tightly around the mouthpiece.
5. Inhale as deeply and slowly as possible from the mouthpiece.
6. Continue to hold for three seconds.
7. For a low flow rate: Inhale at a sufficient rate, raise only the ball in the first chamber while the second chamber ball remains in the rest position.
8. For a high flow rate: Inhale at a rate sufficient to raise the first & second chamber balls while the third chamber ball remains in rest position.
9. Relax, remove mouthpiece and let air out into the room.
10. Rest for a few seconds and repeat exercise.
11. Each treatment should consist of at least ten deep inhalations, followed by three to five normal breathing cycles.
12. After each set of 10 deep breaths, practice coughing to be sure the lungs is clear. Support the incision when coughing by placing a pillow firmly against it.

13. Have child rest as needed.

PILOT STUDY

In order to test the relevance & practicability of the study a pilot study was conducted among six subjects in the same manner of the original study in government Rajaji hospital, Madurai. Data was analyzed to find out suitability of statistics & feasibility.

DATA COLLECTION PROCEDURE

The period of data collection was 6 weeks. Formal permission to conduct the study was obtained from the Ethical committee headed by the Principal, head of department of pediatric nursing of Sacred Heart Nursing College and also from the Head of Pediatric department, surgical ward, Government Rajaji hospital, Madurai. The investigator had undergone training to do the respiratory assessment under the Head of the Department of pediatric surgery for one week. Each week nearly 10-12 samples were collected. Every week from Monday to Saturday data was collected. At first the study was conducted for control group for first 3 weeks without chest physiotherapy and incentive spirometry. 30 samples were collected during this period. Then the study was conducted for experimental group with intervention. Respiratory status was assessed preoperatively for both experimental group and control group before giving intervention in order to confirm their respiratory status. Incentive spirometry exercises were given to the experimental group from preoperative period till 5th postoperative period. The spirometry exercise was given to each patient for 15 minutes, 3 times daily with 4th hour interval. On the second postoperative day, Chest physiotherapy sessions were started from the first postoperative day and given for two times daily (morning: 7-8am and evening: 4-5pm) till fifth postoperative day. Parents were instructed not to given meal, snacks or water before one hour and often empty stomach is preferred. The observational checklist regarding respiratory status and respiratory complications were used to assess the respiratory condition of the patient.

The posttest respiratory status was assessed for both experimental group and control group on second, third and fourth postoperative days. The posttest respiratory complications were assessed for both experimental group and control group on fifth postoperative day. The respiratory status and respiratory complications were again counter checked by the pediatrician for each patient.

The total numbers of study samples are 60.

FLOW CHART

Selection of samples by assessing the preoperative respiratory status

Number of samples in Experimental group = 30. | Number of samples in control group =30

Preoperatively, incentive spirometry exercises were started. | No intervention given.

Postoperative respiratory status assessment & administration of chest physiotherapy only and incentive spirometry ← Days 1-4 → Postoperative respiratory status assessment & no intervention given.

Assessment of postoperative respiratory complication. ← Day 5 → Assessment of postoperative respiratory complication.

DATA ANALYSIS

Data analysis was done according to the objectives of the study. Both descriptive and inferential statistics were used, to analyze the data.

PROTECTION OF HUMAN RIGHTS

- The proposed study was conducted after the approval of dissertation committee of the college.

- Permission was obtained from pediatric surgical ward of government Rajaji hospital, Madurai.
- Oral consent of each subject will be obtained before starting the data collection.

SUMMARY

This chapter dealt with research approach, research design, setting population, and sample, sampling technique, development of data collection tool and testing of tool.

CHAPTER - IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the description of sample analysis and interpretation of the data collected to evaluate the achievement of the objectives of the study. The data collected is tabulated and described as follows:

SECTION I: Demographic profile of the samples.

- Frequency and percentage distribution of the samples according to their age & sex.
- Frequency and percentage distribution of samples according to the type of surgery.

SECTION II:

- Frequency and percentage distribution of samples based on respiratory Status preoperatively.

SECTION III:

- Frequency and percentage distribution of samples based on respiratory status on first postoperative day.

SECTION IV:

- Frequency and percentage distribution of samples based on respiratory status on fourth postoperative day.

SECTION V:

- Comparison of mean respiratory status of the experimental group between first and second postoperative day.

- Comparison of mean respiratory status of the experimental group between first and third postoperative day.
- Comparison of mean respiratory status of the experimental group between first and fourth postoperative day.

SECTION VI:

- Comparison of mean post test respiratory status of experimental & control group on second postoperative day.
- Comparison of mean post test respiratory status of experimental group & control group on third postoperative day.
- Comparison of mean posttest respiratory status of experimental & control group on fourth postoperative day.

SECTION VII:

- Comparison of frequency and percentage distribution of respiratory complications

  between experimental group & control group.
- Comparison of mean respiratory complications of experimental & control group on fifth postoperative day.

SECTION VIII:

- Association of post test respiratory status of experimental group & selected demographic variables.
- Association of post test respiratory complications of experimental group & selected demographic variables.

SECTION - I

DEMOGRAPHIC PROFILE OF THE SAMPLES

TABLE 1

Frequency and percentage distribution of the samples according to their age & sex.

N = 60

Demographic Characteristics	Experimental Group n = 30		Control Group n= 30		Total N = 60	
	f	**%**	**f**	**%**	**f**	**%**
Child's Age						
a. 3-6 years	8	26.7	12	40	20	33
b. 7-12 years	22	73.3	18	60	40	67
Sex						
a. Male	18	60	17	56.7	35	58
b. Female	12	40	13	43.3	25	42

Table 1 shows that in experimental group out of 30 children, 8 (26.7%) were between the age of 3-6 years & 22 (73.3%) were in the age group of 7-12 years. Regarding the sex, in the experimental group 18 (60%) out of 30 were male & 12 (40%) were female. In the control group out of 30 children, 12 (40%) were between the age of 3-6years & 18(60%) were in the age group of 7-12 years. Regarding the sex, in the control group out of 30, 17(56.7%) were males & 13 (43.3%) were female.

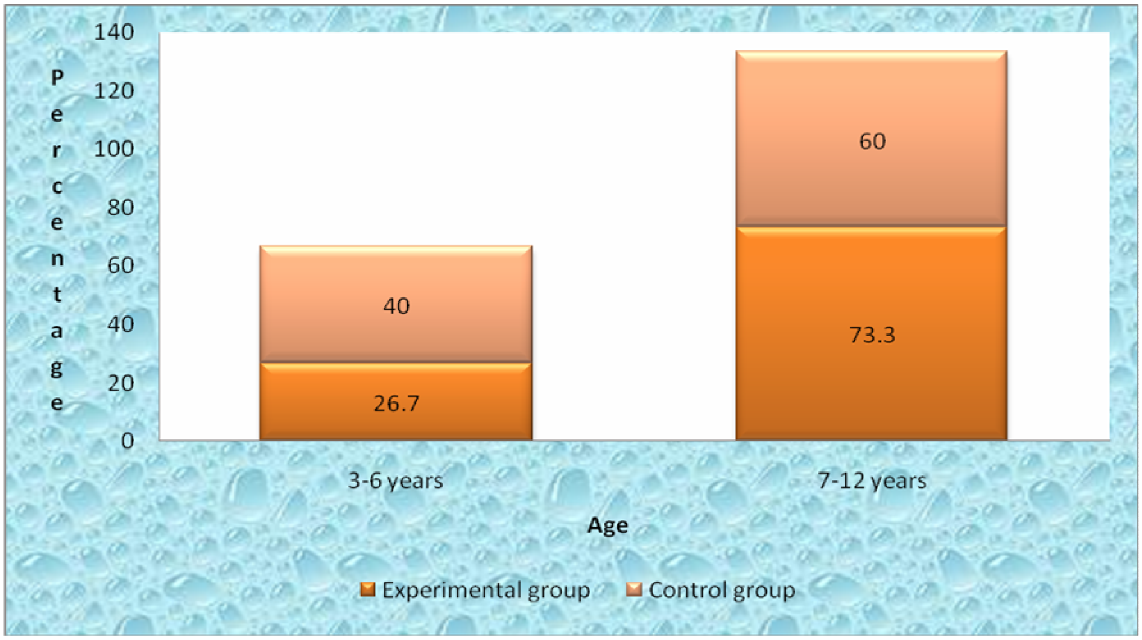

Figure 2 : Distribution of samples according to age

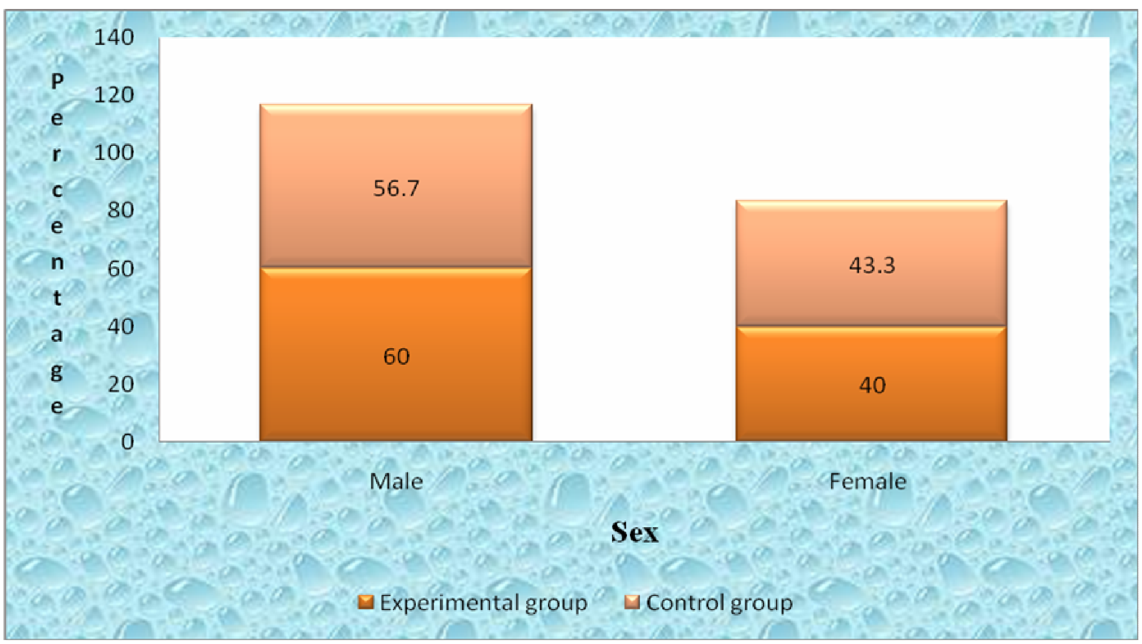

Figure 3: Distribution of samples according to sex

TABLE 2:

Frequency and percentage distribution of samples according to the type of surgery

N=60

Demographic Characteristics	Experimental Group n = 30		Control Group n= 30		Total N = 60	
	f	%	f	%	f	%
Appendicectomy	8	26.7	7	23.3	15	25
Colostomy	4	13.3	2	6.7	6	10
Ureterolithotomy	5	16.7	4	13.3	9	15
Cholecystectomy	4	13.3	6	20	10	17
Laproscopic surgery	3	10	3	10	6	10
Herniorrhaphy	4	13.3	5	16.7	9	15
Herniotomy	2	6.7	3	10	5	8

As for the type of abdominal surgery in the experimental group out of 30 children, 8 (26.7%) underwent appendicectomy, 4 (13.3%) colostomy,5(16.7%) ureterolithotomy, 4 (13.3%) cholecystectomy, 3 (10%) laproscopic surgery, 4 (13.3%) herniorrhaphy, 2 (6.7%) herniotomy.

In control group out of 30 children, 7 (23.3%) underwent appendicectomy, 2 (6.7%) colostomy, 4(13.3%) ureterolithotomy, 6(20%) cholecystectomy, 3 (10%) laproscopic surgery, 5 (16.7%) herniorrhaphy, 3 (10%) herniotomy.

SECTION - II

TABLE 3:

Distribution of samples based on respiratory status pre operatively.

N = 60

Respiratory status	Experimental group				Control group			
	Normal respiratory status		Altered respiratory status		Normal respiratory status		Altered respiratory status	
	f	%	f	%	f	%	f	%
Respiratory rate	29	96.6	1	3.33	30	-	-	-
Pulse rate	27	90	3	10	27	90	3	10
Temperature	29	96.6	1	3.33	29	96.6	1	3.33
Chest retractions	30	100	-	-	30	100	-	-
Use of accessory muscles	30	100	-	-	30	100	-	-
Nasal flaring	28	100	-	-	30	100	-	-
Cough	30	93.3	2	6.6	29	96.6	1	3.33
Wheezing	30	100	-	-	30	100	-	-
Air entry	30	100	-	-	30	100	-	-
Unilateral expansion of chest	30	100	-	-	30	100	-	-
Shape of the chest	30	100	-	-	30	100	-	-
Dyspnea	30	100	-	-	30	100	-	-
Breath sounds	30	100	-	-	30	100	-	-
Discoloration of fingers & lips	30	100	-	-	30	100	-	-

Table 3 represents the distribution of samples based on respiratory status of the experimental group and control group preoperatively. It is evident that in experimental group and control group, 59(98.3%) children had normal respiratory rate,1(1.7%) had altered respiratory rate; 54(90%) had normal pulse rate 6(10%)had altered pulse rate; 58(96.6%) had normal temperature,2(3.3%) had alerted temperature;57 (95%) did not have cough, 3(5%) had cough; both in the experimental and control group nobody had the following characteristics such as chest retractions, using of accessory muscle, nasal flaring, wheezing, altered air entry, shape of the chest, abnormal breath sound and discolouration of finger and lips.

SECTION - III

TABLE 4:

Distribution of samples based on respiratory status on the first post operative day.

N = 60

Respiratory status	Experimental group				Control group			
	Normal respiratory status		Altered respiratory status		Normal respiratory status		Altered respiratory status	
	f	%	f	%	f	%	f	%
Respiratory rate	-	-	30	100	-	-	30	100
Pulse rate	11	36.6	19	63.3	9	30	21	70
Temperature	6	20	24	80	1	3.33	29	96.6
Chest retractions	21	70	9	30	18	60	12	40
Use of accessory muscles	29	96.6	1	3.33	25	83.3	5	16.7
Nasal flaring	25	83.3	5	16.6	18	60	12	40
Cough	10	33.3	20	66.6	18	60	12	40
Wheezing	29	96.6	1	3.33	30	100	-	-
Air entry	29	96.6	1	3.33	28	93.3	2	6.7
Unilateral expansion of chest	29	96.6	1	3.33	21	70	9	30
Shape of the chest	30	100	-	-	30	100	-	-
Dyspnea	14	46.6	16	53.3	4	13.3	26	86.7
Breath sounds	26	86.6	4	13.3	16	53.3	14	46.7
Discoloration of fingers & lips	30	100	-	-	30	100	-	-

Table 4 represents the distribution of samples based on respiratory status in the experimental group and control group on the first postoperative day.

On the first postoperative day in experimental group, 30 (100%) children had altered respiratory rate, 19 (63.3%) had altered pulse rate, 24 (80%) had altered temperature, 9 (30%) had chest retractions, one (3.33%) child used accessory muscle for breathing, 5 (16.6%) had nasal flaring, 20 (66.6%) had cough, wheezing, altered air entry and unilateral expansion of chest were present each in one (3.33%) child, 16 (53.3%) had dyspnea, 4 (13.3%) had abnormal breath sounds.

In control group, 30 (100%) children had altered respiratory rate, 21 (70%) had altered pulse rate, 29 (96.6%) had altered temperature, 12 (40%) had chest retractions, 5 (16.7%) child used accessory muscle for breathing, 12 (40%) had nasal flaring, 12 (40%) had cough, 2(6.7%) had altered air entry, 9 (30%) had unilateral expansion of chest, 26 (86.7%) had dyspnea,14 (46.7%) had abnormal breath sounds.

SECTION - IV

TABLE 5:

Distribution of samples based on respiratory status on the fourth post operative day

N = 60

Respiratory status	Experimental group				Control group			
	Normal respiratory status		Altered respiratory status		Normal respiratory status		Altered respiratory status	
	f	%	f	%	f	%	f	%
Respiratory rate	25	83.3	5	16.7	8	26.7	22	73.3
Pulse rate	27	90	3	10	17	56.7	13	43.3
Temperature	30	100	-	-	25	83.3	5	16.7
Chest retractions	30	100	-	-	27	90	3	10
Use of accessory muscles	30	100	-	-	29	96.6	1	3.33
Nasal flaring	30	100	-	-	27	90	3	10
Cough	27	90	3	10	18	60	12	40
Wheezing	30	100	-	-	28	93.3	2	6.67
Air entry	29	96.6	1	3.33	28	93.3	2	6.67
Unilateral expansion of chest	28	93.3	2	6.67	21	70	9	30
Shape of the chest	30	100	-	-	30	100	-	-
Dyspnea	29	96.6	1	3.33	16	53.3	14	46.7
Breath sounds	28	93.3	2	6.67	22	73.3	8	26.7
Discoloration of fingers & lips	30	100	-	-	30	100	-	-

Table 5 shows that, on the fourth postoperative day, in experimental group there was altered respiratory rate in five (16.7%) children, altered pulse rate and cough, each is present in three (10%) children, unequal air entry and dyspnea each is present in one (3.33%) children, abnormal breath sounds and unilateral expansion of chest, each is present in two (6.67%) children.

In the control group, altered respiratory rate is present in 22 (73.3%) children, altered pulse rate in 13 (43.3%)children, altered temperature in five children(16.7%), chest retractions in three (10%) children, use of accessory muscles in one child(3.33%), nasal flaring in three(10%) children, cough in 12 (40%) children, wheezing and altered air entry in two children each(6.67%), unilateral expansion of chest in nine (30%) children, dyspnea in 14 (46.7%) children, abnormal breath sounds in eight (26.7%) children.

SECTION - V

TABLE 6:

Comparison of mean respiratory status of the experimental group between first and second postoperative day

N = 60

Variables	Test	Mean	SD	't' value	p value
Experimental group	First post operative day	18.46	1.42	6.18 *	0.05
	Second post operative day	17.1	0.93		

*** Significant at 0.05 level**

To find out if there is any difference between the postoperative respiratory status between the first and second postoperative day, the null hypothesis is stated as follows.

There will be no significant difference between the postoperative respiratory status of the experimental group between the first and second postoperative day.

In the present study the respiratory status was measured using an observational checklist. A higher score indicated poor respiratory status whereas a low score indicated good respiratory status.

Table 6 shows that The mean respiratory status score 17.1 on second postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained't' value is 6.18 which is significant at 0.05 level. This indicates that the difference between the mean 1.36 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the second postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

Table 7:

Comparison of mean respiratory status of the experimental group between first and third postoperative day.

N = 60

Variables	**Test**	**Mean**	**SD**	**'t' value**	**p value**
	First post operative day	18.46	1.42		
Experimental group				14.15 *	0.05
	Third post operative day	15.63	1.37		

*** Significant at 0.05 level**

To find out if there is any difference between the postoperative respiratory status between the first and third postoperative day, the null hypothesis is stated as follows.

There will be no significant difference between the postoperative respiratory status of the experimental group between the first and third postoperative day.

Table 7 shows that the mean respiratory status score 15.63 on third postoperative day after administration of chest physiotherapy and incentive spirometry which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained't' value is 14.15 which is significant at 0.05 level. This indicates that the difference between the mean 2.83 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy & incentive spirometry on the third postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

Table 8:

Comparison of mean respiratory status of the experimental group between first and fourth postoperative day.

N = 60

Variables	Test	Mean	SD	't' value	p value
	First post operative day	18.46	1.42		
Experimental group				21.27	0.05
	Fourth post operative day	14.53	2.05		

*** Significant at 0.05 level**

To find out if there is any difference between the postoperative respiratory status between the first and fourth postoperative day, the null hypothesis is stated as follows.

There will be no significant difference between the postoperative respiratory status of the experimental group between the first and fourth postoperative day.

Table 8 shows that the mean respiratory status score 14.53 on fourth postoperative day after administration of intervention package which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained't' value is 21.27 which is significant at 0.05 level. This indicates that the difference between the mean 3.93 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy & incentive spirometry on the fourth postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

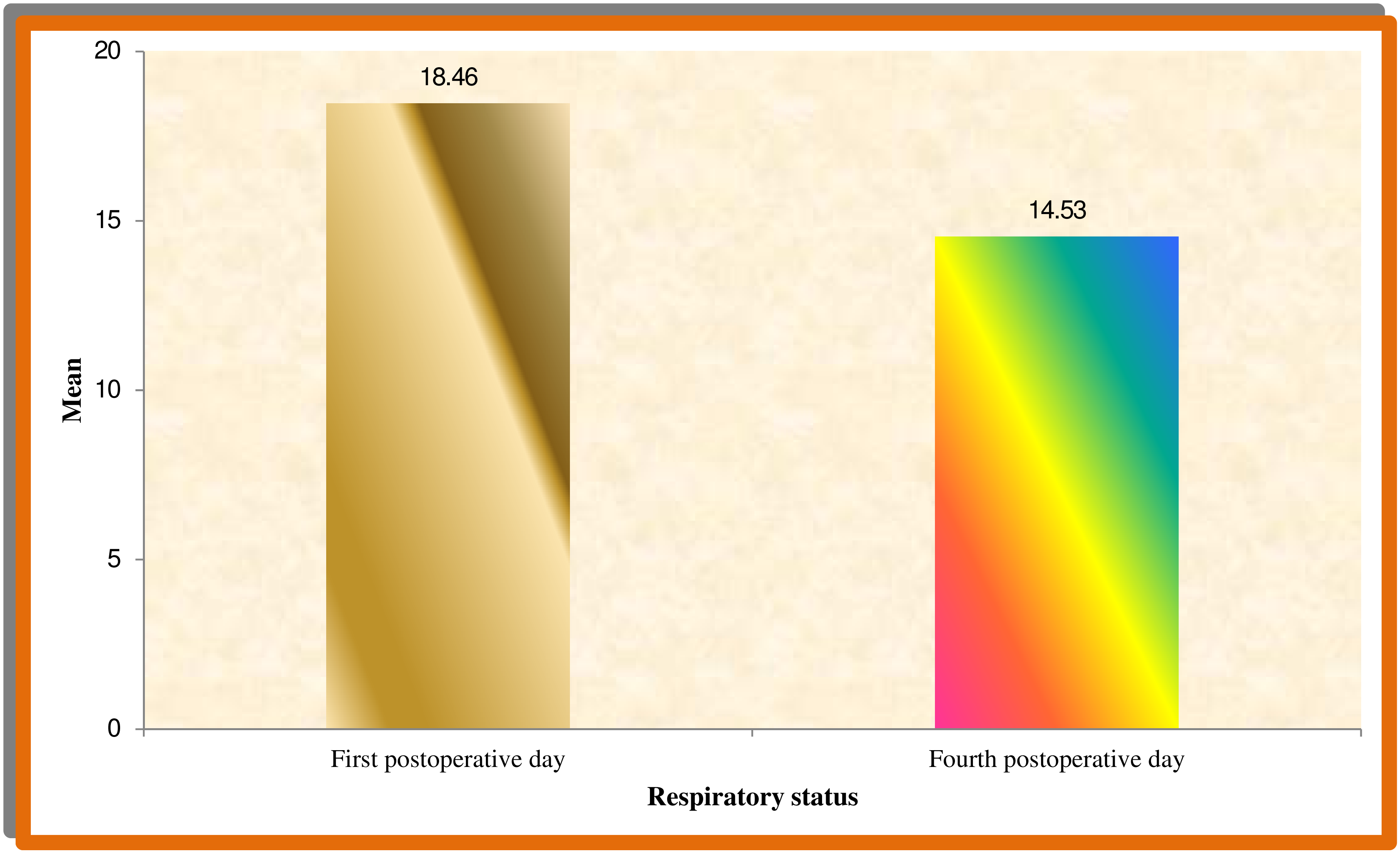

Figure 7: Comparison of mean respiratory status of the experimental group between first and fourth postoperative day.

SECTION - VI

Table 9:

Comparison of mean post test respiratory status of the experimental group and control group on second postoperative day.

N = 60

Variables	N	Mean	SD	't' value	p value
Experimental group	30	17.1	0.93	7 *	0.05
Control Group	30	19.13	1.38		

*** Significant at 0.05 level**

To find out if there is any difference between the mean posttest respiratory status of the experimental group and control group after administration of chest physiotherapy and incentive spirometry on second postoperative day, the null hypothesis is stated as follows.

In the present study, there will be no significant difference between the posttest respiratory status of the experimental group and control group.

Table 9 shows that the mean posttest respiratory status score of the experimental group 17.1 after administration of chest physiotherapy and incentive spirometry which is lesser than the mean posttest respiratory status score of the control group 19.13 on second postoperative day. The obtained't' value is 7 which is significant at 0.05 level. This indicates that the difference between the mean 2.03 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the second postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

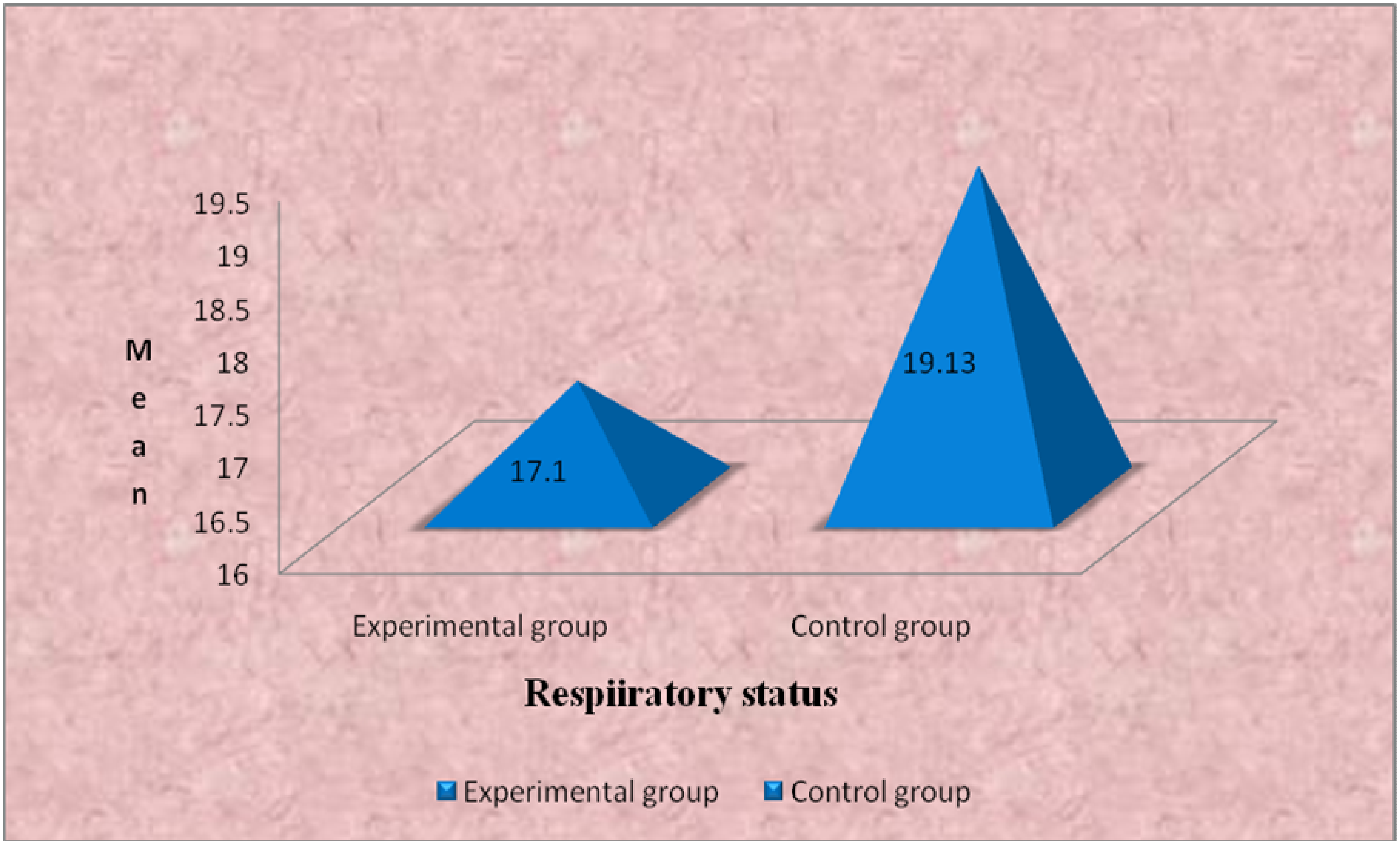

Figure 8 : Comparison of mean posttest respiratory status of Experimental group and Control group on second postoperative day.

Table 10:

Comparison of mean post test respiratory status of the experimental group and control group on third postoperative day.

N = 60

Variables	N	Mean	SD	't' value	p value
Experimental group	30	15.63	1.37	7.5 *	0.05
Control Group	30	18.03	1.216		

*** Significant at 0.05 level**

To find out if there is any difference between the mean posttest respiratory status of the experimental group and control group after administration of chest physiotherapy and incentive spirometry on third postoperative day, the null hypothesis is stated as follows.

In the present study, there will be no significant difference between the posttest respiratory status of the experimental group and control group.

Table 10 shows that the mean posttest respiratory status score of the experimental group 15.63 after administration of chest physiotherapy and incentive spirometry which is lesser than the mean posttest respiratory status score of the control group 18.03 on third postoperative day. The obtained't' value is 7.5 which is significant at 0.05 level. This indicates that the difference between the mean 2.4 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the third postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

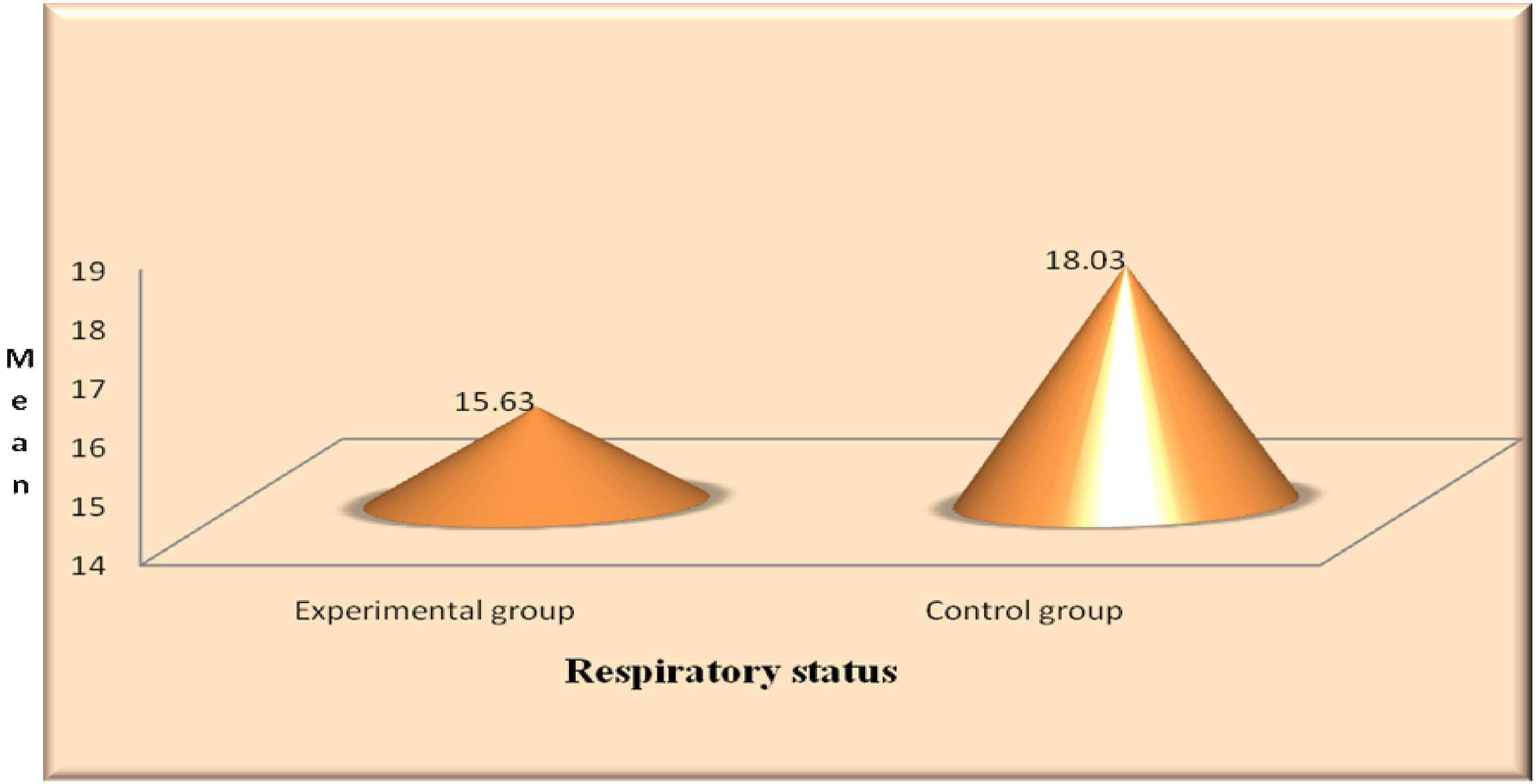

Figure 9 : Comparison of mean posttest respiratory status of Experimental group and Control group on third postoperative day.

Table 11:

Comparison of mean post test respiratory status of the experimental group and control group on fourth postoperative day.

N = 60

Variables	N	Mean	SD	't' value	p value
Experimental group	30	14.53	2.05	5.59 *	0.05
Control Group	30	17.16	1.8		

*** Significant at 0.05 level**

To find out if there is any difference between the mean posttest respiratory status of the experimental group and control group after administration of chest physiotherapy and incentive spirometry on fourth postoperative day, the null hypothesis is stated as follows.

In the present study, there will be no significant difference between the post test respiratory status of the experimental group and control group.

Table 11 shows that the mean posttest respiratory status score of the experimental group 14.53 after administration of chest physiotherapy and incentive spirometry which is lesser than the mean posttest respiratory status score of the control group 17.16 on fourth postoperative day. The obtained't' value is 5.59 which is significant at 0.05 level. This indicates that the difference between the mean 2.63 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

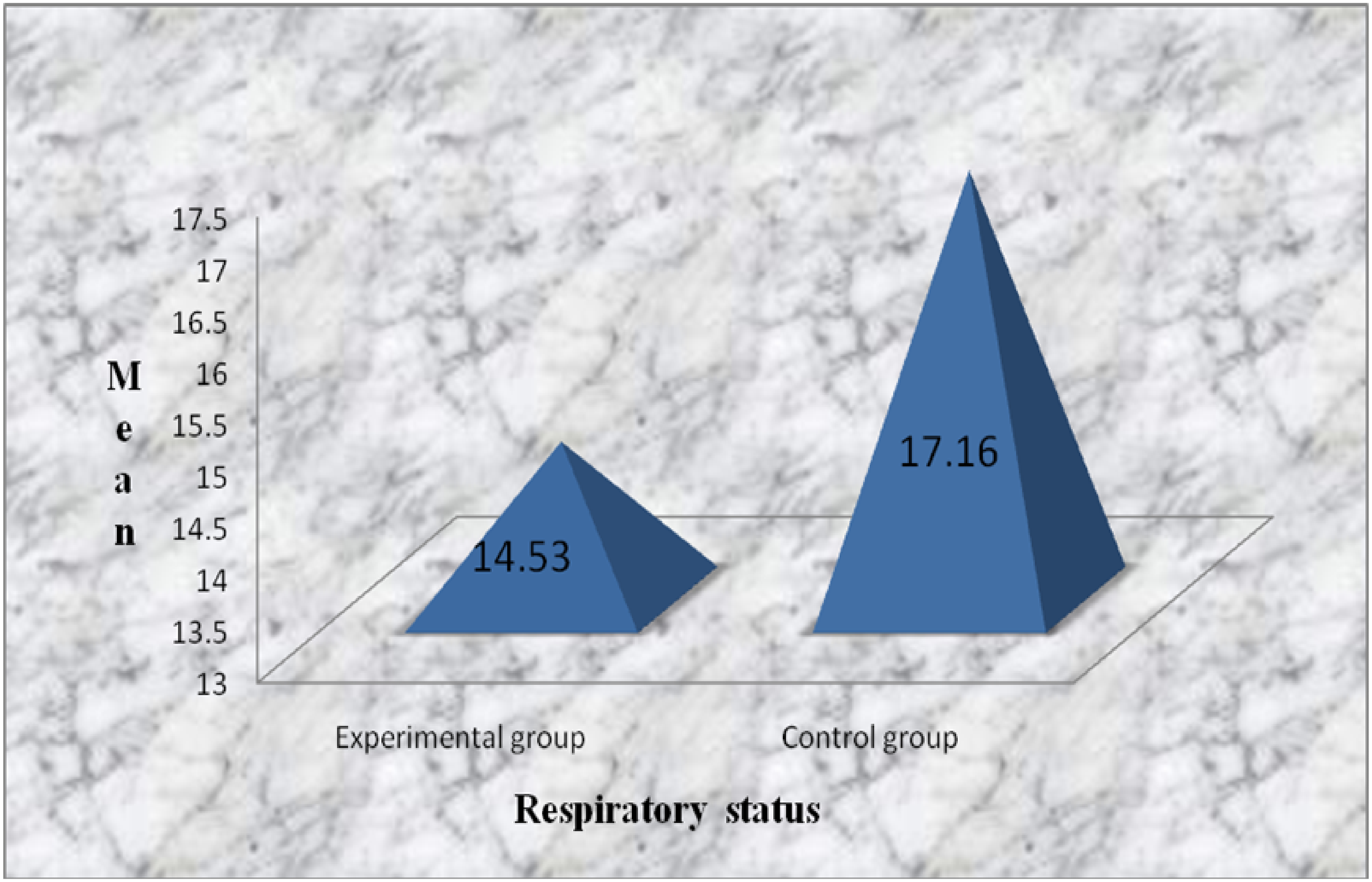

Figure 10 : Comparison of mean posttest respiratory status of Experimental Group and Control Group on fourth postoperative day.

SECTION - VII

Table 12:

Comparison of frequency and percentage distribution of respiratory complications between the experimental group and control group on fifth postoperative day.

N = 60

Respiratory Complications	Experimental Group n = 30		Control Group n= 30	
	f	%	f	%
Atelectasis	1	3.33	2	6.66
Pneumonia	-	-	3	10
Pleural effusion	1	3.33	3	10
Emphysema	-	-	2	6.66

Table 12 shows that in the experimental group, out of 30 children, one (3.3%) had

atelectasis, one (3.3%) had pleural effusion. In the control group out of 30 children, two (6.66%) had atelectasis, 3(10%) had pneumonia, 3(10%) had emphysema, 2(6.66%) had pleural effusion. Therefore it was concluded that after administration of chest physiotherapy and incentive spirometry, the proportion of respiratory complications in the experimental group was lesser than the control group.

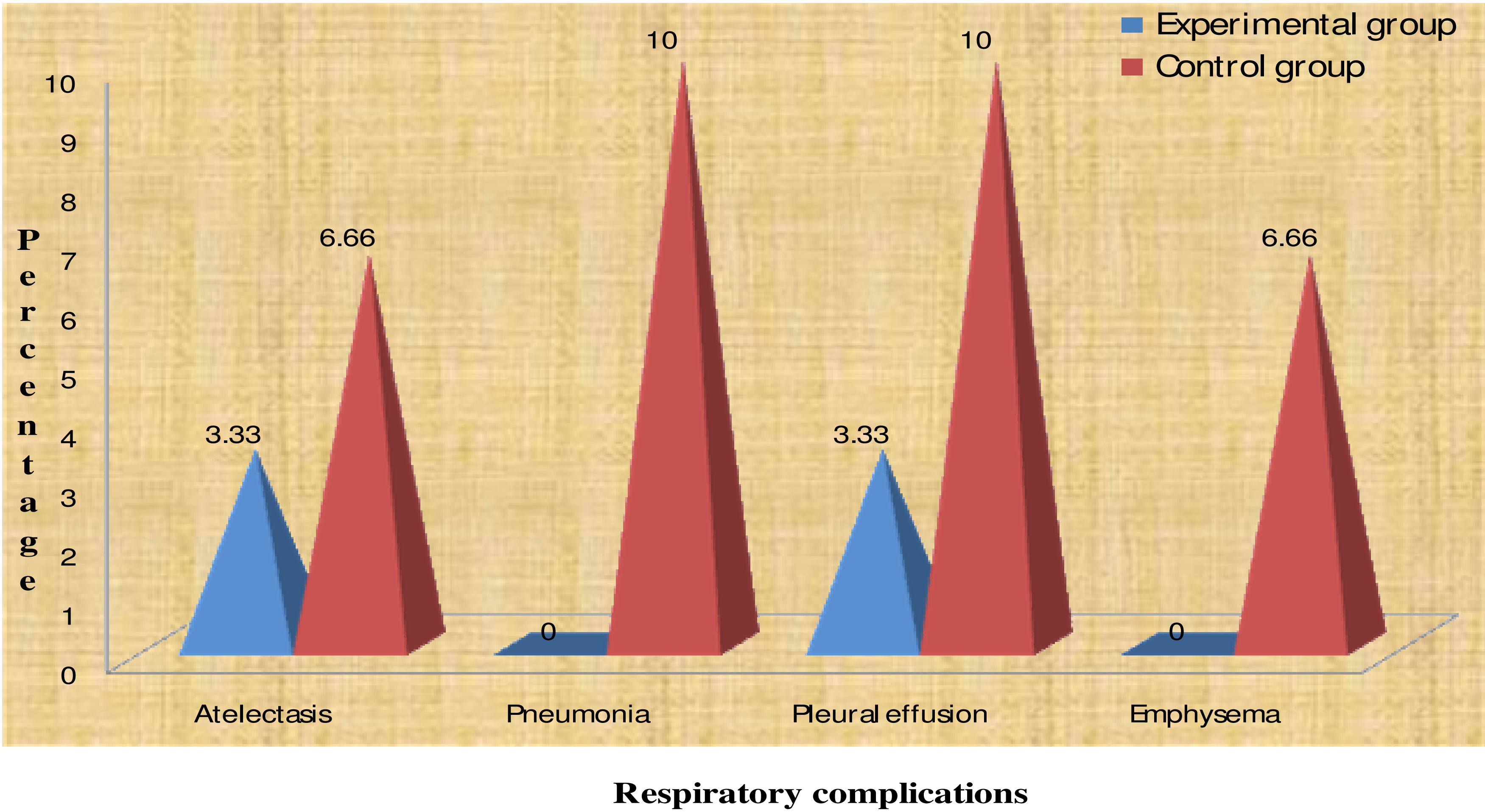

Figure 11 : Comparison of proportion of respiratory complications between Experimental group and Control Group on fifth postoperative day.

Table 13:

Comparison of mean respiratory complications of the experimental group and control group.

N = 60

Variables	N	Mean	SD	‘t’ value	p value
Experimental group	30	0.04	0.75		
				2.71 *	0.05
Control Group	30	0.92	1.43		

*** Significant at 0.05 level**

To find out if there is any difference between the mean respiratory complications of the experimental group and control group after administration of chest physiotherapy and incentive spirometry on fifth postoperative day, the null hypothesis is stated as follows.

In the present study, there will be no significant difference between the post test respiratory complications of the experimental group and control group.

Table 13 shows that The mean respiratory complications of the experimental group 0.04 after administration of chest physiotherapy and incentive spirometry on fifth postoperative day is lesser than the mean respiratory complications of the control group 0.92. The obtained‘t’ value is 2.71 which is significant at 0.05 level. This indicates that the difference between the mean (0.88) is a true difference and has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis.

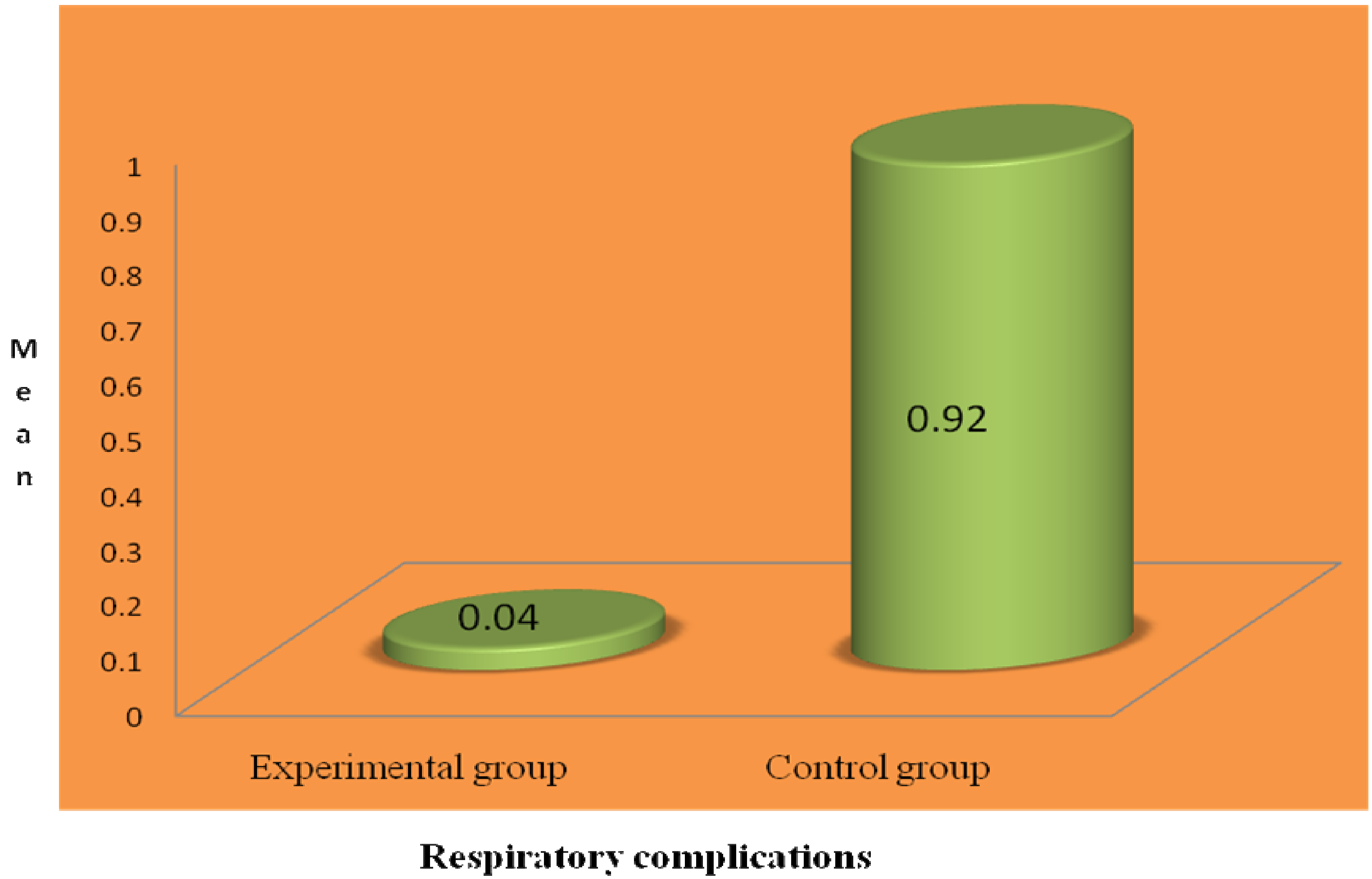

Figure 12 : Comparison of mean Respiratory complications between Experimental Group and Control Group on fifth postoperative day.

SECTION - VIII

Table 14

Association of posttest respiratory status of experimental group and selected variables.

N = 60

Variables	Respiratory status Score Below mean	Above mean	N	$\chi 2$ Value	df	'P' Value
Age (in years)						
a. 3-6 years	7	1	8	1.108#	1	0.05
b. 7-12 years	15	7	22			
Sex						
a. Male	12	6	18	0.8556#	1	0.05
b. Female	10	2	12			
Type of surgery						
a. Appendicectomy	6	2	8			
b. Colostomy	3	1	4			
c. Ureterolithotomy	3	2	5			
d. Cholecystecomy	4	0	4	2.51#	7	0.05
e. Laproscopic surgery	2	1	3			
f. Heriorrhaphy	3	1	4			
g. Herniotomy	1	1	2			

#not significant at 0.05 level

To find out if there is any difference between the respiratory status and age, sex and type of surgery, the null hypothesis is stated as follows.

In the present study, there will be no association between the respiratory status of the subjects and selected variables. (age, sex and type of surgery). In order to find out the association between respiratory status and selected variables, the chi-square test was computed. The obtained $\chi2$ value 1.108 at df (1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi2$ value 0.85 at df (1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi2$ value is 2.51 at df (7) was not significant at 0.05 level.

Thus we can conclude that age, sex, and type of surgery has no effect on respiratory status after administration of chest physiotherapy and incentive spirometry.

Table 15

Association of posttest respiratory complications of experimental group and selected variables

N = 60

Variables	**Respiratory status Score** Below mean	Above mean	**N**	**χ2 Value**	**df**	**'P' Value**
Age (in years)						
a. 3-6 years	8	-	8	3.84#	1	0.05
b. 7-12 years	20	2	22			
Sex						
a. Male	17	1	18			
b. Female	11	1	12	0.088#	1	0.05
Type of surgery						
a. Appendicectomy	7	1	8			
b. Colostomy	4	0	4			
c. Ureterolithotomy	5	0	5			
d. Cholecystecomy	4	0	4	7.16#	7	0.05
e. Laproscopic surgery	3	0	3			
f. Heriorrhaphy	3	1	4			
g. Herniotomy	2	0	2			

#Not significant at 0.05 level

To find out if there is any difference between the respiratory complications and age, sex and type of surgery, the null hypothesis is stated as follows.

In the present study, there will be no association between the respiratory complications of the subjects and selected variables. (age, sex and type of surgery).

In order to find out the association between respiratory complications of experimental group after administration of chest physiotherapy and incentive spirometry and selected variables, the chi-square test was computed.

The obtained $\chi 2$ value 3.84 at df (1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi 2$ value is 0.088 at df(1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi 2$ value is 7.16 at df (7) was not significant at 0.05 level.

Thus we can conclude that age, sex, and type of surgery has no effect on respiratory complications after administration of chest physiotherapy and incentive spirometry.

CHAPTER –V

DISCUSSION

The study evaluated the effectiveness of incentive spirometry and chest physiotherapy on postoperative respiratory status and respiratory complications among 3 to 12 years children after abdominal surgery. The study findings are discussed in this chapter with reference to the objectives, framework and hypotheses stated in chapter I.

Demographic characteristics of the samples

Table 1 shows the distribution of samples according to demographic variables, in experimental group out of 30 children, 8 (26.7%) were between the age of 3 to 6 years and 22(73.3%) were in the age group of 7 to 12 years. Regarding sex, in the experimental group out of 30 children 18 (60%) were male and 12(40%) were female.

In the control group out of 30 children, 12 (40%) were between the age of 3-6years & 18(60%) were in the age group of 7-12 years. Regarding sex, in the control group out of 30, 17(56.7%) were male & 13 (43.3%) were female.

Table 2 shows the distribution of samples according to the type of surgery, in the experimental group out of 30 children, 8 (26.7%) underwent appendicectomy, 4 (13.3%) colostomy, 5(16.7%) ureterolithotomy, 4 (13.3%) cholecystectomy, 3 (10%) laparoscopic surgery, 4 (13.3%) herniorrhaphy, 2 (6.7%) herniotomy.

In control group out of 30 children, 7 (23.3%) underwent appendicectomy, 2 (6.7%) colostomy, 4(13.3%) ureterolithotomy, 6(20%) cholecystectomy, 3 (10%) laproscopic surgery, 5 (16.7%) herniorrhaphy, 3 (10%) herniotomy.

THE FIRST OBJECTIVE OF THIS STUDY WAS TO DETERMINE THE RESPIRATORY STATUS OF CHILDREN PREOPERATIVELY

Table 3 represents the distribution of samples based on respiratory status of the experimental group and control group preoperatively. It is evident that in experimental group and control group, 59(98.3%) children had normal respiratory rate,1(1.7%) had altered respiratory rate; 54(90%) had normal pulse rate 6(10%)had altered pulse rate; 58(96.6%) had normal temperature,2(3.3%) had alerted temperature;57 (95%) did not have cough, 3(5%) had cough; Both in the experimental and control group no body had the following characteristics such as chest retractions, using of accessory muscle, nasal flaring, wheezing, altered air entry, shape of the chest, abnormal breath sound and discolouration of finger and lips.

These findings represent the importance of having normal respiratory status before surgery. Hence the preoperative assessment conducted by the researcher helps to include all the possible samples and also guided in excluding the children who have upper respiratory tract infection. During this period the researcher felt that this preoperative respiratory assessment not only helped to select the samples but also helped to relieve the parental worries and queries. This was reflected in the verbatim of the mothers of children who were undergoing surgery.

"I don't have any supportive persons to clarify my doubts but after talking with the health personnel makes me to feel relax and gained confidence in giving care to my child."

Becky McCall (2010) studied that children at high risk for preoperative respiratory adverse events could be systematically identified at the preanaesthetic assessment, and the information gained there could be used to optimize anesthetise care. They might also benefit from specifically targeted anaesthesia management. Risk factors found to be associated with perioperative respiratory complications which include a recent cold, wheezing during exercise, wheezing more than three times in the previous 12 months, nocturnal dry cough, eczema, and a family history of asthma, rhinitis, eczema, or exposure to tobacco smoke. He found that these risk factors are easily identified by a risk assessment questionnaire that can be used in everyday clinical practice to optimize anaesthesia care for every child.

Von ungensternberg (2010) recommended that children who have been identified to be at a particularly high risk for respiratory complications can benefit from a preoperative optimization of lung function by the primary care physician, if indicated and time allows, and targeted anaesthesia management, which should include a specialist paediatric anaesthetist, intravenous induction of anaesthesia, maintenance of anaesthesia with proposal, and avoidance of invasive airway management, if possible.

Selecting the samples with normal respiratory status preoperatively is necessary for both the experimental and control group in order to avoid bias.

THE SECOND OBJECTIVE OF THIS STUDY WAS TO FIND OUT THE POSTOPERATIVE RESPIRATORY STATUS OF CHILDREN WHO HAD ABDOMINAL SURGERY AFTER RECEIVING CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY.

Table 4 represents the distribution of samples based on respiratory status in the experimental group and control group on the first postoperative day.

On the first postoperative day in experimental group, 30 (100%) children had altered respiratory rate, 19 (63.3%) had altered pulse rate, 24 (80%) had altered temperature, 9 (30%) had chest retractions, 1 (3.33%) child used accessory muscle for breathing, 5 (16.6%) had nasal flaring, 20 (66.6%) had cough, wheezing, altered air entry and unilateral expansion of chest were present each in one (3.33%) child, 16 (53.3%) had dyspnea, 4 (13.3%) had abnormal breath sounds.

In control group, 30 (100%) children had altered respiratory rate, 21 (70%) had altered pulse rate, 29 (96.6%) had altered temperature, 12 (40%) had chest retractions, 5 (16.7%) child used accessory muscle for breathing, 12 (40%) had nasal flaring, 12 (40%) had cough, 2(6.7%) had altered air entry, 9 (30%) had unilateral expansion of chest, 26 (86.7%) had dyspnea,14 (46.7%) had abnormal breath sounds.

Desmonts et al., (2007) studied the effects of upper or lower abdominal surgery on diaphragmatic function. Changes in abdominal and rib cage movements, and in vital capacity were compared between 23 patients undergoing upper or lower abdominal surgery on 1,3 and 7 days after surgery. Diaphragmatic index was obtained by measuring the relative abdominal motion using magnetometers. After upper abdominal surgery, the vital capacity and the diaphragmatic index were markedly reduced for one week. No abdominal muscle activity was observed at day one. After lower abdominal surgery the vital capacity returned to the normal range within three days of operation, without any diaphragmatic impairment. These findings substantiate the role of diaphragmatic dysfunction in postoperative reduction in vital capacity observed after upper abdominal surgery.

Table 5 shows the distribution of samples based on respiratory status in the experimental and control group on the fourth postoperative day.

In experimental group there was altered respiratory rate in five (16.7%) children, altered pulse rate and cough, each is present in three (10%) children, unequal air entry and dyspnea each is present in one (3.33%) children, abnormal breath sounds and unilateral expansion of chest, each is present in two (6.67%) children.

In the control group, altered respiratory rate was present in 22 (73.3%) children, altered pulse rate in 13 (43.3%)children, altered temperature in five children(16.7%), chest retractions in three (10%) children, use of accessory muscles in one child(3.33%), nasal flaring in three(10%) children, cough in 12 (40%) children, wheezing and altered air entry in two children each(6.67%), unilateral expansion of chest in nine (30%) children, dyspnea in 14 (46.7%) children, abnormal breath sounds in eight (26.7%) children.

The researcher found that the frequency of normal respiratory status was present most commonly in the subjects of experimental group. This may be due to the prophylactic administration of chest physiotherapy and incentive spirometry. Additionally the children enjoyed the spirometry exercises which was reflected in their verbatim like,

"This spirometer was like a play article which helps me to enjoy and relax".

The study finding was supported by Jackie A Thomas and McIntosh (2006) who conducted a Meta analyses to quantitatively assess the conflicting body of literature concerning the efficacy of incentive spirometry (IS), intermittent positive pressure breathing (IPPB) and deep breathing exercises (DBEX) in the prevention postoperative pulmonary complication in patients undergoing upper abdominal surgery. The common odds ratio (COR) for the occurrence of pulmonary complications for incentive spirometry versus no physical therapy was 0.44 in favour of incentive spirometry. The common odds ratio for deep breathing exercise versus no physical therapy was 0.43 in favour of deep breathing exercise. Researcher concluded that spirometry and DBEX appear to be more effective than no physical therapy intervention in the improvement of respiratory status and prevention of postoperative pulmonary complication.

Reinhart et al., (1990) described that perioperative respiratory therapy is needed for patients who are undergoing upper abdomen and thoracotomy surgeries to prevent postoperative pulmonary complications. He also suggested that high risk patients also should learn prophylactic respiratory manuveurs preoperatively.

THE THIRD OBJECTIVE OF THIS STUDY WAS TO EVALUATE THE EFFECTIVENESS OF CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY ON POSTOPERATIVE RESPIRATORY STATUS OF CHILDREN WHO HAD ABDOMINAL SURGERY.

***Comparison of mean respiratory status of the experimental group between first and second postoperative day*.**

As stated in table 6, the mean respiratory status score 17.1 on second postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained‘t’ value is 6.18 which is significant at 0.05 level. This indicates that the difference between the mean 1.36 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of using chest physiotherapy and incentive spirometry on the second postoperative day.

***Comparison of mean respiratory status of the experimental group between first and third postoperative day*.**

As stated in table 7, The mean respiratory status score 15.63 on third postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained'tʼ value is 14.15 which is significant at 0.05 level. This indicates that the difference between the mean 2.83 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the third postoperative day.

***Comparison of mean respiratory status of the experimental group between first and fourth postoperative day*.**

As stated in table 8, the mean respiratory status score 14.53 on fourth postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained'tʼ value is 21.27 which is significant at 0.05 level. This indicates that the difference between the mean 3.93 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.

This study finding coincides with the following study. The researcher has done a study on breathing training that reduces postoperative pulmonary complications. Preoperative inspiratory muscle training (1MT) was employed in half of the patients (n=139) while the other half received usual care (n= 139). IMT involved patients performing tailored exercises incentive spirometry, education in active cycle of breathing techniques, and forced education techniques. He found that postoperative pulmonary complications were present in 25(18%) patients receiving IMT training compared with 48(35%) of patients in the usual care group (odds ratio 0.52). pneumonia occurred in 9(6.5%) of the patients in the IMT group compared with 22(16.1%) in the usual care group (OR 0.40). Median duration of postoperative hospitalization was seven days in the IMT group Vs eight days in the usual care group which shows the early recovery of respiratory status and presence of fewer complications in the intervention group. (Hulzebos, 2006).

Comparison of mean posttest respiratory status of experimental and control group on second postoperative day.

As stated in table 9, the mean posttest respiratory status score of the experimental group 17.1 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group 19.13 on second postoperative day. The obtained‘t’ value is 7 which is significant at 0.05 level. This indicates that the difference between the mean 2.03 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the second postoperative day. Hence the researcher rejects the null hypothesis and the above findings support the research hypothesis.

Comparison of mean posttest respiratory status of experimental and control group on third postoperative day.

As stated in table 10, the mean posttest respiratory status score of the experimental group 15.63 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group 18.03 on third postoperative day. The obtained‘t’ value is 7.5 which is significant at 0.05 level. This indicates that the difference between the mean 2.4 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the third postoperative day. Hence the researcher rejects the null hypothesis and the above findings support the research hypothesis.

Chumillas et al (1998) also supported the same. He studied 81 patients who had upper abdominal surgery distributing them in to two homologous groups, control (n=41) and rehabilitation (n=40). Preoperative and postoperative clinical evaluation, spirometry, arterial gasometry and simple chest X-rays were performed. The incidence of postoperative pulmonary complications was 7.5% in the rehabilitation group and 19.5% in the control group. It is concluded that respiratory rehabilitation protects against postoperative pulmonary complications and was more effective in moderate and high risk patients.

Comparison of mean posttest respiratory status of experimental and control group on fourth postoperative day.

As stated in table 11, the mean posttest respiratory status score of the experimental group 14.53 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group 17.16 on fourth postoperative day. The obtained‘t’ value is 5.59 which is significant at 0.05 level. This indicates that the difference between the mean 2.63 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.

The following study supports the above finding. Carol and prins (1998) studied 153 children who had non-compromised pulmonary status. The control group (84 patients) engaged in no breathing exercises, and the respiratory therapy group (69 patients) engaged in preoperative and postoperative breathing exercises. Postoperative pulmonary complications were classified using criteria derived from chest roentgenograms, arterial blood gas samples and temperature. The incidence of postoperative pulmonary complications in the treatment group and in the control group was 19% and 60% respectively. It was concluded that preoperative and postoperative respiratory therapies have a prophylactic treatment for upper abdominal surgery children.

THE FOURTH OBJECTIVE OF THIS STUDY WAS TO FIND OUT THE POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHILDREN WHO HAD ABDOMINAL SURGERY AFTER RECEIVING CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY.

***Comparison of the frequency and percentage distribution of respiratory complications between experimental group and control group on the fifth postoperative day*.**

As depicted in table 12, in the experimental group, out of 30 children, one (3.3%) had atelectasis; one (3.3%) had pleural effusion. In the control group out of 30 children, two(6.66%) had atelectasis, 3(10%) had pneumonia, 3(10%) had emphysema, 2(6.66%) had pleural effusion. Therefore it was concluded that after administration of chest physiotherapy and incentive spirometry, the proportion of respiratory complications in the experimental group was less than the control group.

Isabel Yanez (2009) also has the similar findings. He studied 263 children underwent both elective and emergency surgeries, 159 (60.5%) patients received preoperative physiotherapy. A physiotherapist provided a daily session involving incentive spirometry, deep breathing exercise, coughing and early ambulation. He found that the most frequent post operative complications in the control group were hypoventilation (90.7%), pleural effusion (47.5%) and atelecasis (24.7%). In the univariate analysis, prophylactic physiotherapy was associated with a lower incidence of anaesthesia.

As the researcher used chest x-ray to confirm the diagnosis, the assessment findings were more reliable. Postoperative respiratory complication identified by the researcher was once again confirmed by the paediatric surgeon. If sputum analysis and arterial blood gas analysis were performed, that might add the accuracy of the tool.

THE FIFTH OBJECTIVE OF THIS STUDY WAS TO EVALUATE THE EFFECTIVENESS OF CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY ON POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHILDREN WHO HAD ABDOMINAL SURGERY.

***Comparison of mean respiratory complications between experimental and control group on fifth postoperative day*.**

As depicted in table 13, the mean respiratory complications of the experimental group 0.04 after administration of chest physiotherapy and incentive spirometry on fifth postoperative day was lesser than the mean respiratory complications of the control group 0.92. The obtained‘t’ value is 2.71 which is significant at 0.05 level. This indicates that the difference between the mean (0.88) is a true difference and has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day. Hence the researcher rejects the null hypothesis. The above findings support the research hypotheses.

The following study supports the above findings. Westwood et al., (2007) posited that chest physiotherapy aims to decrease the likelihood of postoperative pulmonary complications and hasten recovery. In a non-randomized pilot study of 263 patients, it has been found that the addition of the incentive spirometer, as part of an intensive postoperative physiotherapy programme, decreased the occurrence of pulmonary complications (6 vs 17% P=0.01) and length of stay on the surgical high dependency unit (3.1 vs 4 days P=0.03).

THE SIXTH OBJECTIVE OF THIS STUDY WAS TO FIND OUT THE ASSOCIATION BETWEEN POSTTEST RESPIRATORY STATUS OF THE CHILDREN IN EXPERIMENTAL GROUP AND THEIR SELECTED VARIABLES. (AGE, SEX, TYPE OF SURGERY).

In order to find out the association between respiratory status of experimental group after administration of chest physiotherapy & incentive spirometry and selected variables, the chi-square test was computed. The obtained $\chi 2$ value 1.108 at df (1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi 2$ value 0.85 at df (1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi 2$ value 2.51 at df (7) was not significant at 0.05 level. Thus we can conclude that age, sex, and type of surgery has no effect on respiratory status after administration of intervention package.

THE SEVENTH OBJECTIVE OF THE STUDY WAS TO FIND OUT THE ASSOCIATION BETWEEN POSTTEST RESPIRATORY COMPLICATION OF THE CHILDREN IN EXPERIMENTAL GROUP AND THEIR SELECTED VARIABLES. (AGE, SEX, TYPE OF SURGERY).

In order to find out the association between respiratory complications of experimental group after administration of chest physiotherapy & incentive spirometry and selected variables, the chi-square test was computed. The obtained $\chi 2$ value 3.84 at df (1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi 2$ value 0.088 at df (1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi 2$ value 7.16 at df (7) was not significant at 0.05 level. Thus we can conclude that age, sex, and type of surgery has no effect on respiratory complications after administration of chest physiotherapy and incentive spirometry.

Stettner, et al (1995) compared the incidence of complications between open cholecystectomy and laparoscopic cholecystectomy. He found that the complication rate in the open cholecystectomy group was 7.7% whereas in laparoscopic cholecystectomy group the complication rate was 1.9%. He also concluded that laparoscopic surgeries can be performed safely with an overall complication rate that is distinctly lower than that of open surgeries.

In this study, there was no significant difference in the complication rate between the laparoscopic and other types of surgeries. This may be due to the smaller sample size.

CHAPTER –VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This chapter deals with the summary of the study and the conclusions drawn. It also deals with the limitation of the study, the implications and recommendations given for different areas of nursing and for the health care delivery system.

SUMMARY OF THE STUDY

This study was undertaken to determine the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status and respiratory complications among children aged 3-12 years after abdominal surgery.

The following objectives were set for the study:

- To determine the respiratory status of children preoperatively.
- To find out the respiratory status of children who had abdominal surgery after receiving the chest physiotherapy and incentive spirometry.
- To evaluate the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status of children who had abdominal surgery.
- To find out the postoperative respiratory complications of children who had abdominal surgery after receiving the chest physiotherapy and incentive spirometry.

- To evaluate the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory complications of children who had abdominal surgery.

- To find out the association between posttest respiratory status of the children in experimental group and their selected variables.(age, sex, type of surgery).
- To find out the association between posttest respiratory complication of the children in experimental group and their selected variables. (age, sex, type of surgery).

HYPOTHESES

All the hypotheses were tested at 0.05 level of significance:

H_1: The mean respiratory status of the experimental group on 4th post operative day who had chest physiotherapy and incentive spirometry will be significantly higher than their mean respiratory status on 1st postoperative day.

H_2: The mean post-test respiratory status of the experimental group who hadchest physiotherapy and incentive spirometry will be significantly higher than the mean posttest respiratory status of the control group.

H_3: The postoperative respiratory complications of the experimental group who had chest physiotherapy and incentive spirometry will be significantly lower than the post-operative respiratory complications of control group.

H_4: There will be significant association between postoperative respiratory status of the children who received chest physiotherapy and incentive spirometry & their selected variables. (age, sex, type of surgery).

H_5: There will be significant association between postoperative respiratory complication of the children who received chest physiotherapy & their selected variables. (age, sex, type of surgery).

MAJOR FINDINGS OF THE STUDY

1. Regarding the age in the experimental group, out of 30 children, 8 (26.7%) were between the age of 3-6 years & 22 (73.3%) were in the age group of 7-12 years. In the control group out of 30 children, 12 (40%) were between the age of 3-6years & 18(60%) were in the age group of 7-12 years.
2. Regarding the sex, in the experimental group 18 (60%) out of 30 were male & 12 (40%) were female. In the control group out of 30, 17(56.7%) were male & 13 (43.3%) were female.
3. In the experimental group out of 30 children, 8 (26.7%) underwent appendicectomy, 4 (13.3%) colostomy,5(16.7%) ureterolithotomy, 4 (13.3%) cholecystectomy, 3 (10%) laproscopic surgery, 4 (13.3%) herniorrhaphy, 2 (6.7%) herniotomy. In control group out of 30 children, 7 (23.3%) underwent appendicectomy, 2 (6.7%) colostomy, 4(13.3%) ureterolithotomy, 6(20%) cholecystectomy, 3 (10%) laproscopic surgery, 5 (16.7%) herniorrhaphy, 3 (10%) herniotomy.
4. The mean respiratory status score 17.1 on second postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained 't' value is 6.18 which is significant at 0.05 level. This indicates that the difference between the mean 1.36 is a true difference has not occurred

by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the second postoperative day.

5. The mean respiratory status score 15.63 on third postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained ‘t’ value is 14.15 which is significant at 0.05 level. This indicates that the difference between the mean 2.83 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the third postoperative day.
6. The mean respiratory status score 14.53 on fourth postoperative day after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean respiratory status score 18.46 on first postoperative day. The obtained ‘t’ value is 21.27 which is significant at 0.05 level. This indicates that the difference between the mean 3.93 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.
7. The mean posttest respiratory status score of the experimental group 17.1 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group 19.13 on second postoperative day. The obtained ‘t’ value is 7 which is significant at 0.05 level. This indicates that the difference between the mean 2.03 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the second postoperative day.
8. The mean posttest respiratory status score of the experimental group 15.63 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group

18.03 on third postoperative day. The obtained ‘t’ value is 7.5 which is significant at 0.05 level. This indicates that the difference between the mean 2.4 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the third postoperative day.

9. The mean posttest respiratory status score of the experimental group 14.53 after administration of chest physiotherapy and incentive spirometry, which is lesser than the mean posttest respiratory status score of the control group 17.16 on fourth postoperative day. The obtained ‘t’ value is 5.59 which is significant at 0.05 level. This indicates that the difference between the mean 2.63 is a true difference has not occurred by chance. The difference between the two means could be due to the effect of chest physiotherapy and incentive spirometry on the fourth postoperative day.
10. In the experimental group, out of 30 children, one(3.3%) had atelectasis, one(3.3%) had pleural effusion. In the control group out of 30 children, two(6.66%) had atelectasis, 3(10%) had pneumonia, 3(10%) had emphysema, 2(6.66%) had pleural effusion. Therefore it was concluded that after administration of chest physiotherapy and incentive spirometry, the proportion of respiratory complications in the experimental group was less than the control group.
11. The mean respiratory complications of the experimental group 0.04 after administration of chest physiotherapy and incentive spirometry on fifth postoperative day is lesser than the mean respiratory complications of the control group 0.92. The obtained ‘t’ value is 2.71 which is significant at 0.05 level. This indicates that the difference between the mean (0.88) is a true difference and has not occurred by chance. The difference between the two

means could be due to the effect of intervention package on the fourth postoperative day.

12. In order to find out the association between respiratory status of experimental group after administration of chest physiotherapy & incentive spirometry and selected variables, the chi-square test was computed. The obtained $\chi 2$ value 1.108 at df(1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi 2$ value 0.85 at df(1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi 2$ value 2.51 at df(7) was not significant at 0.05 level. Thus we can conclude that age, sex, and type of surgery has no effect on respiratory status after administration of chest physiotherapy and incentive spirometry.
13. In order to find out the association between respiratory complications of experimental group after administration of chest physiotherapy & incentive spirometry and selected variables, the chi-square test was computed. The obtained $\chi 2$ value 3.84 at df(1) between respiratory status and age was not significant at 0.05 level. There was no association between respiratory status and sex, the obtained $\chi 2$ value 0.088 at df(1) was not significant at 0.05 level. There was no association between respiratory status and type of surgery, the obtained $\chi 2$ value 7.16 at df (7) was not significant at 0.05 level. Thus we can conclude that age, sex, and type of surgery has no effect on respiratory complications after administration of chest physiotherapy and incentive spirometry.

CONCLUSIONS

The following conclusions were drawn from the study,

1. The respiratory status of the experimental group improved significantly after administration of chest physiotherapy and incentive spirometry.
2. The respiratory status of the experimental group who had chest physiotherapy and incentive spirometry was significantly higher than the control group.
3. The respiratory complications of the experimental group who had chest physiotherapy and incentive spirometry were lesser than the control group.
4. There was no association found between the respiratory status, respiratory complications and selected variables. (age, sex and type of surgery.)

IMPLICATIONS

Chest physiotherapy and incentive spirometry are a vital component in the management of children who had undergone major abdominal surgery.

Implications for nursing practice

a. Nursing personnel has a major responsibility in addressing the risk of complications and in the best position to impart breathing exercises involving chest physiotherapy and incentive spirometry in the hospital and community as a part of the treatment measures related to abdominal surgery.

b. The nurse can help the students to practice the breathing exercise involving chest physiotherapy and incentive spirometry in hospital set up.

c. The nurse can plan and provide instructional module about breathing exercises to the mothers and children according to the developmental level.

d. The nurse can use the respiratory status and complication assessment check list as a screening tool to treat the high risk children before undergoing surgery.

e. The study indicate the importance of teaching breathing exercises involving chest physiotherapy and incentive spirometry to children who had abdominal surgery by the nursing personnel working in the postoperative surgical wards.

f. This study will help nurse practitioners to independently give chest physiotherapy and incentive spirometry than other treatment modalities in the management of children undergoing abdominal surgery.

Implications for Nursing education

The study proved that chest physiotherapy and incentive spirometry was effective in improving respiratory functions. To practice this, nursing personnel need to be equipped with adequate knowledge regarding everything about lung expansion technique.

1. This methods and importance of chest physiotherapy and incentive spirometry should be added to the nursing curriculum so that the nursing

students can come to know about chest physiotherapy and incentive spirometry and its uses in improving respiratory functions and reducing respiratory complications.

2. Nursing educator can motivate the students in pediatric surgical units to practice chest physiotherapy and incentive spirometry preoperatively in improving respiratory status and to reduce postoperative pulmonary complications.
3. The knowledge of chest physiotherapy and incentive spirometry will help the nursing students to implement these exercises and assessing its effect among children with abdominal surgery.

Implications for Nursing Research

1. This study also brings about the fact that more studies need to be conducted by comparing the different lung expansion techniques and other treatment modalities in improving respiratory functions.
2. This study can be a baseline for future studies to build upon.

Implications for Nursing Administration

1. The number of staff in the surgical wards and postoperative unit must be increased so that they can teach and practice chest physiotherapy and incentive spirometry in improving respiratory status and reducing the respiratory complications.
2. Staff development programme can be arranged for the staff in the surgical unit to provide training in assessing respiratory status and administering lung expansion techniques like incentive spirometry, chest physiotherapy, deep breathing exercises.

3. The nurse administrator can plan health education programme about breathing exercises for children undergoing surgery.
4. The nurse administrator can formulate a policy for the routine utilization of incentive spirometers in breathing exercises for children undergoing surgeries.
5. Incentive spirometers can be supplied to surgical ward so that the exact improvement in respiratory status and pulmonary functions can be monitored.
6. Pamphlets regarding breathing exercises can be prepared and given to parents, charts regarding techniques of spirometry exercises and various positions for postural drainage can be fixed in the surgical ward, so that it can motivate the parents to teach chest physiotherapy and incentive spirometry for their children.

LIMITATIONS

1. The sample size in the experimental group and control group were 30, hence the findings should be generalized with caution.
2. The setting of the study was selected due to the convenience of the researcher, hence the findings can be generalized only to the selected setting.

RECOMMENDATIONS

1. Similar kind of study can be conducted for larger samples.
2. Similar study can be conducted by measuring arterial blood gas analysis(ABG) to find out the effectiveness of incentive spirometry and chest physiotherapy.

3. A comparative study can be conducted with various combinations like deep breathing exercise vs incentive spirometry, incentive spirometry vs chest physiotherapy and deep breathing exercise vs chest physiotherapy.
4. Similar kind of study can be conducted for children who are other respiratory disorders and children who are undergoing cardiac surgeries.
5. The same study can be conducted start few days ahead preoperatively also for a longer duration.
6. The replication study can be done for other surgeries.
7. Sputum test and oxygen saturation can also be included as parameters to assess the respiratory status.
8. A similar study can be conducted to assess the skill of staff nurses regarding lung expansion techniques.
9. Similar kind of study can be conducted to evaluate the effect of breathing exercise with the help of chest physiotherapy and incentive spirometry independently.
10. A similar study can be done in various other settings.

REFERENCES

📖 AARC clinical practice guidelines- Incentive spirometry. (1991). *Respiratory care*, 36(12), 1402-1405.
Retrieved from, http://www.rcjournal.com/cpgs/ispircpg.html

📖 Ahmed, H., Sayed, Q., Zaki, N. (2002). Perioperative management of children with sickle cell disease undergoing major abdominal surgery. *Saudi medical journal*, 23 (10), 1294-1296.

📖 Balachandran, A., Shivbalan, S., Thangavelu, S. (2005). Chest physiotherapy in Pediatric practice. *Indian paediatrics*, 42(6), 559-567.

📖 Becky McCall, (2010). *Preanesthesia Assessment Identifies Children at Risk for Respiratory Complications before Surgery*. Retrieved from, http://www.medscape.com/viewarticle/729161

📖 Brooks-Brunn, J.A. (1997). Postoperative atelectasis and Pneumonia. *Heart and Lung: The Journal of Acute and Critical Care*, 24 (2), 94-115.

📖 Canet, J., Mazo, V. (2010). Postoperative pulmonary complication. *Minnerva anestesiologica*,76(20),138-143.Retrieved from, http://www.anestesia-dolor.org/repositorio/Seguridad complicaciones%20pulmonares%20post%20operatorias.pdf

📖 Celli, B.R., Rodriguez, K.S. & Snider, G.L. (1984). Incentive spirometry and deep breathing exercises in preventing pulmonary complications after abdominal surgery. *Journal of archives of respiratory disease*, 130(1), 12-15.

🕮 Chest physiotherapy (2010). *Nursing review*, Retrieved from http://www.currentnursing.com/reviews/chest_physiotherapy.html

🕮 Chumillas, Ponce, Delgado, F. (1998). Prevention of Postoperative Pulmonary Complications through respiratory rehabilitation: A Controlled Clinical study. *Archives of Physical Medicine and Rehabilitation*, 79(1) 5-9.

🕮 Colin Wallis, Ammani Prasad, (1990). Who needs chest physiotherapy? Moving from anecdote to evidence. *Archives of diseases in childhood*, 80(4), 393-397. doi: 10.1136/adc.80.4.393

🕮 Delacruz, B., Teresita, S., Guia, Nerissa A., Milagros S., **&** Dulce R.(2009). *Journal of chest*, Retrieved from, http://meeting.chestpubs.org/cgi/content/abstract/136/4/35S-c

🕮 Denise, F. Polit. and Cheryl Tatano Beck. (2004). *Nursing Research*. New Delhi: Lippincott Williams and Wilkins.

🕮 Dureuil, B., Cantineau, P., Desmonts, (1987). Effects of upper or lower abdominal surgery on diaphragmatic function. *British journal of anesthesia*. 59(10), 1230-1235.

🕮 Ephgrave, K.S., Kleiman, R., Pfaller, M., Booth, B., Werkmeister, L., Young, S. (1993). Postoperative pneumonia: a prospective study of risk factors and morbidity. *Surgery*, 114(4), 815-819. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8211699

🕮 Fagevik, M., Hahn, I., Nordgren, S., Lundholm, K. (1997). Randomized controlled trial of prophylactic chest physiotherapy in major abdominal surgery. *British journal of surgery*, 84 (11), 1535-1538.

- Fedorovich, C., Littleton, M.T. (1990). Chest physiotherapy: evaluating the effectiveness . *Dimensions of critical care nursing*, 9 (2), 68-74.
- Felardo, A., Faresin, S.M. & Fernandez, A. (2002). Postoperative pulmonary complication after abdominal surgery. *Journal of Rev Assoc Med Bras*, 48 (3), 207-216.
- Fikret, K., Ayse, G., Turgut, T., Murat, G. (2007). Factors for postoperative pulmonary complications in upper abdominal surgery. *ANZ Journal of surgery*, 77 (3), 135-141, doi: 10.1111/j.1445-2197.2006.03993.x
- Fung, E., Cave, D., Witmans, M., Gan, K., El-Hakim, H. (2010). *Postoperative respiratory complications and recovery in obese children following adenotonsillectomy for sleep-disordered breathing,* 142(6), 898-905. Retrieved from, http://www.ncbi.nlm.nih.gov/pubmed/20493365
- Hall, J.C, Tarala, R., Harris, J., Tapper, J. and Christiansen, K. (1991). Incentive spirometry versus routine chest physiotherapy for prevention of pulmonary complications after abdominal surgery. *Journal of Lancet*, 334 (8747), 953-6.
- Hockenberry, J.M., Wilson, D. (2009). *Wong's Essentials of Pediatric Nursing*. Missouri: Elsevier publication.
- Hulzebos, J.H., Helders,M.J., Favie, J., Vanmeeteren, U.L. (2006). Preoperative intensive inspiratory muscle training to prevent postoperative pulmonary complications in high risk patients undergoing CABG

surgery. *The journal of the American medical association,* 296(15), 1851-1857, doi: 10.1001/jama.296.15.185

🕮 Isabel, y., Fernandez, S.P., Alberto, S., Ursicino, M.G., Sonia, P., Angeles, M. (2009). Respiratory physiotherapy and incidence of pulmonary complications in off-pump coronary artery bypass graft surgery. *BMC pulmonary medicine*, 9:36 , doi: 10.1186/1471-2466-9-36

🕮 Johannes, P. van de Leur. (2003). *Physiotherapy Theory and Practice*. Philadelphia: W.B. Saunders Company.

🕮 Julia, B. George. (1996). *Nursing Theories*. New Jersey: Prentice Hall Company.

🕮 Kocabas, A., Kara, K., Ozqur, G., Sonmez, H., Burgut, R. (1995). Value of preoperative spirometry to predict postoperative pulmonary complications. *Respiratory medicine*, 90 (1), 25-33.

🕮 Laurie Barclay, (2005). *Pulmonary Complications of Major Abdominal Surgery May be increasing in US*. Retrieved from http://www.medscape.com/viewarticle/557529

🕮 Lawrence, V.A., Cornell, J.E. & Smetana, G.W. (20060. Strategies to reduce postoperative pulmonary complications. *Journal of ACP club*, 18: 144 (8), 596-608.

🕮 Lie C, Kehlet, H., Rosenberg, J.(1998), Lung physiotherapy as prophylaxis against atelectasis and pneumonia after abdominal surgery. *Ugeskr Laegr*, 160 (24), 3540-4, Retrieved from,http://www.ncbi.nlm.nih.gov/pubmed/9641039

🕮 Luiz Neto, Carlos, Rosa, C. (2005). Postoperative respiratory complications from elective and urgent/emergent surgery performed at a university hospital. *Journal Brasileiro de Pneumolgia*, 31(1) 27-29.

doi: 10.1590/S1806-37132005000100008

📖 Manzano, R.M., Celso, R.,Beatriz, M., Joaquim, E.(2008). Chest physiotherapy during immediate postoperative period among patients undergoing upper abdominal surgery. *Sao Paulo medical journal*, 126(5), doi: 10.1590/s1516-31802008000500005

📖 Malhotra, N., Parveen, M., Verma, D.(2007). Incentive spirometry in tracheostomized patients. *Journal of anesthesia and clinical pharmacology*, 23 (1), 77-78.

📖 Mathew, J.T., D'Souza, G.A., Kilpadi, A.B.(1999). Respiratory complications in postoperative patients. *The journal of the association of physicians in India*, 47 (11), 1086-88.

📖 Mc Alister, a., Bertsch, k., Man, J.,Bradley, J., Jacka, M. (2005). Incidence of and risk factors for pulmonary complications after non-thoracic surgery. *Journal of Respiratory Critical Care Medicine*, 171(5), 514-7.

📖 Morran, G.C., Flinlay, I.G., Mathieson, M., Mckay, Mcardle, C.S.(1983). Randomized controlled trial of physiotherapy for postoperative pulmonary complication. *British journal of Anesthesia*, 55(11), 1113-1117.

📖 Muhammed, A.K., Hussain, S.F. (2005). Preoperative pulmonary evaluation. *Journal of Ayub medical college Abbottabad*, 17 (4), 1-5.

📖 Pankaj, K., Vitheeswaran, M., Nagappa, M., Sistla, S. (2010). Effect of preoperative and postoperative incentive spirometry on lung functions after laparoscopic cholecystectomy. *Surgical laparoscopy, endoscopy & percutaneous techniques,* 20(3), 170-172, doi: 10.1097/SLE.0b013e3181db81ce

🕮 Parthasarathy, A. (2007). *Textbook of Paediatrics*. New Delhi: Jaypee Publications.

🕮 Pathak, I.C. (2009). Paediatric surgery in India: Now and Then. *Journal of Indian Association Paediatric surgeons,* 14(1), 3-5.

🕮Peter, R.(2006).Perioperative management of patients at risk of postoperative pulmonary complication. *Advance studies in medicine*, 6(10),441-9.

🕮 Qaseem, A., Snow, V., Fitterman, N.,Hornbake, R.E., Lawrence, A.E., Smetana, W.G.............Owens, K.D. (2006). Risk Assessment for and strategies to reduce perioperative pulmonary complications for patients undergoing Noncardiothoracic surgeries: A Guideline for the American college of Physicians. *Annals of Internal Medicine*, 144(8), 575-580. Retrieved from, http://www.annals.org/content/144/8/575.full

🕮 Romino, L., Keatley, M., Janet, Kelly, G. (2005). Parental Presence during anesthesia induction in children. *AORN Journal*, 81(4), 779.

🕮 Smetana, W. (n.d.). *Evaluation of Preoperative Pulmonary risk*. http:// www.uptodate.com/patients/content/topic.do?topicKey= C3xbGAayPX8SPH

🕮 Striebel, H.W., Reinhart, (1990). *Perioperative respiratory therapy*. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/1983491

🕮 Sundar Rao, P.S.S., and Richard, J. (2006). *Introduction to Bio-statistics and Research Methods.* New Delhi: Jaypee Publications.

🕮 Thomas, J.A., McIntosh, J.M. (1994). Are incentive spirometry, intermittent positive pressure breathing, and deep breathing exercises effective in the prevention of postoperative pulmonary complications after upper abdominal surgery? A systematic overview and meta-analysis. *Physical therapy*, 74 (10), 3-10.

- Toshihide, S., Kazufumi, O., Michiaki, S., John, B., McEniery, J. (1994). High incidence of postoperative pulmonary complications after orthotopic liver transplantation in children. *Journal of Anesthesia*, 8(3), 274-276, doi:10.1007/bf02514649

- Ungern-sternberg, B., Boda, K., Neil, A., Rebmann, C., Johnson, C., Peter, S., Habre, W. (2010). Risk assessment for respiratory complications in pediatric anaesthesia. *The Lancet*, 376 (9743), 773-783.
- Wallis, C., Prasad, A.(1999). Who needs CPT? Moving from anecdote to evidence. *Arch Dis Child*, 80: 393-397.
- Warner, O.D. (2005). *Improving postoperative respiratory outcome*, Retrieved from, http://www.euroanesthesia.org/sitecore/content/Education/media/5c1.ashx
- Westwood, K., Griffin, M., Roberts, K., Williams, M., Yoong, K. & Digger, T.(2007). Incentive spirometry decreases respiratory complications following major abdominal surgery. *Journal of Surgeons*, 5(6), 339-342.
- Woerlee, G.M. (2009). *Lung function and Anesthesia*, Retrieved from http://www.anesthesiaweb.org/lung-function.php
- Wynne, R., Botti, M. (2004). Pathogenesis of postoperative pulmonary dysfunction. *American journal of critical care*, 13(5), (Para 1), Retrieved from. http://www.medscape.com/view article/490485

📖 Yoder, A., Sharma, S. (2009). *Perioperative pulmonary management*, Retrieved from, http://emedicine.medscape.com/article/284983-media

APPENDIX- I

COPY OF THE LETTER SEEKING PERMISSION TO CONDUCT THE STUDY IN GOVERNMENT RAJAJI HOSPITAL, MADURAI

Ref: UT: SHNC: 2010

Sacred Heart Nursing college
Ultra Trust, 4/235, college road
Madurai-625 020.

To

The Dean,
Government Rajaji Hospital,
Madurai.

Respected Sir/ Madam,

Sub: Sacred Heart Nursing College, Madurai-Project work of M.Sc., (N) student – permission requested –reg

We wish to state that ________________final year M.Sc., (N) student of our college has to conduct a Research project, which is to be submitted to the Tamilnadu Dr. M.G.R Medical University, Chennai in partial fulfillment of University requirements.

The topic of research project is **'A study to assess the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status and**

respiratory complications among children undergoing abdominal surgery in Government Rajaji Hospital at Madurai'.

We therefore request you to kindly permit her to do the research work under your valuable guidance and suggestions.

Thanking You,

Yours faithfully,

SACRED HEART NURSING COLLEGE

ULTRA TRUST, MADURAI-20

APPENDIX-II

COPY OF LETTER SEEKING EXPERTS OPINION FOR TOOL AND CONTENT VALIDITY

From,

____

II Year M.Sc., Nursing,
Sacred Heart Nursing College
Ultra Trust, Madurai-20.

To,

Respected Madam/Sir,

Sub: Requesting opinion and suggestion of experts for the tool for its validity

I am _______________ II year Master Degree Nursing student in Sacred Heart nursing College. In partial fulfillment of Master Degree in Nursing, I have selected the topic mentioned below for the research project to be submitted to the Dr. M.G.R University, Chennai.

Problem Statement:

A study to assess the effectiveness of chest physiotherapy and incentive spirometry on postoperative respiratory status and respiratory complications among children undergoing abdominal surgery in Government Rajaji Hospital at Madurai.

Hence I request you to kindly examine the tool, content and give your valuable opinion and suggestion for improvement of tool and content.

Enclosure:

- Problem statement
- Demographic profile
- Tool
- Intervention package

Thanking you,

Place: Yours sincerely,

Date: ____________________

APPENDIX-III

List of Experts Consulted for the Content Validity of Research Tool

1. **Dr. Durai raj, M.D(Pediatrics)., D.M., (Neuro)**

   Ramya clinic,

   Madurai.

2. **Dr. Karrupusammy, M.S. (General medicine). D.L.O., M.Ch.,(Pediatrics)**

   Assistant professor

   Government Rajaji Hospital,

   Madurai.

3. **Mrs. Chitra, M.Sc(N)**

   Lecturer

   Aragonda Apollo College of nursing,

   Chitoor. Andhra Pradesh.

4. **Mrs.Jothilakshmi, M.Sc(N).,**

   Lecturer

   Sacred Heart Nursing College,

   Ultra Trust, Madurai

5. **Mrs.Sarojini, M.Sc(N).,**

Lecturer

Sacred Heart Nursing College,

Ultra Trust, Madurai.

6. **Mr. Shanker, M.P.T**.,

   Vice-principal

   Trinity mission and medical foundation

   Madurai.

7. **Mr.Nagaraj, M.P.T.,**

   Clinical physiotherapist

   Saravana Hospital

   Madurai.

APPENDIX -IV

DEMOGRAPHIC PROFILE

Name of the child	:	
Age	:	i) 3-6 years
		ii) 7-12 years
Sex	:	i) Male
		ii) Female
Hospital no.	:	
Ward	:	
Diagnosis	:	
Type of surgery	:	
Date of surgery	:	

APPENDIX-V

OBSERVATIONAL CHECK LIST TO ASSESS RESPIRATORY STATUS: VITAL SIGNS

PART – A

The observer will carefully assess each respiratory status of the child. A score (1) mark will be given by every normal findings and score of (2) marks will be given for each altered findings.

S. No	Observation	Normal Rate	Observed rate for child	Description					
				Preoperative assessment	Post test				
					Day 1	Day 2	Day 3	Day 4	Day 5

1.	Respiratory rate / mt 6 – 12 years 12 -17 years								
2.	Pulse rate / mt 6 – 12 years 12 -17 years								
3.	Temperature								

PART – B

OBSERVATIONAL CHECK LIST FOR ASSESSING RESPIRATORY STATUS

The observer will carefully assess each respiratory status of the child. A score (1) mark will be given for absent (normal respiratory status) & score of (2) marks will be given for present (altered respiratory status).

S. No	Observation	Description					
		Preoperative assessment	Post test				
			Day 1	Day 2	Day 3	Day 4	Day 5
1.	Chest retractions						

	a. Sub-costal						
	b. Intercostal						
	c. Suprasternal						
2.	Use of accessory muscles						
3.	Nasal Flaring						
	a. Intermittent						
	b. Continuous						
4.	Cough						
5.	Wheezing						
6.	Air entry						
	a. Unilateral						
	b. Air entry decreased in both side						
7.	Unilateral expansion of chest						
8.	Abnormal shape of the chest						
9.	Dyspnea						
	a. Mild						
	b. Moderate						
	c. Severe						
10.	Breath sounds						
	a. Crackles						
	b. Rhyles						
11.	Discoloration of finger &						

	lips a. Pale b. Cyanosis						

APPENDIX-VI

OBSERVATIONAL CHECKLIST TO ASSESS RESPIRATORY COMPLICATIONS

Instructions:

The observer will carefully assess each respiratory complications of the child. A score of One (1) will be given for present findings & a score of zero (0) will be given for absent findings.

S. No	Complication	Characteristics

1.	Atelectasis	Fever Diminished respiratory movements Diminished breath sounds Tracheal displacement toward affected side. X –ray : mediastinal shift Tracheal deviation
2.	Pneumonia	Fever Tachypnea Cough Decreased breath sounds Intercostal retractions X –ray: lobar consolidation/ interstitial infiltrates
3.	Emphysema	Dyspnea on exertion Chest expansion reduced & diaphragm movement is limited Frothy white or pink mucoid sputum Diminished Breath sounds.
4.	Pleural effusion	Low grade fever Tachypnea Pleuritic chest pain Dullness to percussion over effusion Diminished or absent breath sounds.

APPENDIX-VII

CHEST PHYSIOTHERAPY

Definition:

Chest physiotherapy (CPT) is a method used to mobilize or loose secretions in the lungs and respiratory tract.

It usually refers to the use of postural drainage in combination with adjunctive techniques that are thought to enhance the clearance of mucus from the airway.

Along with the postural drainage the adjunctive techniques used in this study, consists of various manipulative procedures like chest percussion, cough stimulation and deep breathing exercise through pursed lips and assisting with tactile sense.

Purpose:

- To mobilize secretions and facilitate effective airway clearance.

Equipments:

- ✓ pillows for patient comfort
- ✓ stethoscope
- ✓ towel
- ✓ gloves
- ✓ Collection container for sputum.

Preliminary assessment for chest physiotherapy:

The following are the assessment criteria:

- ✓ Monitor vital signs.
- ✓ Collect the child's medication history, particularly diuretics and antihypertensive cause fluid and hemodynamic changes. These decrease child's tolerance to positional changes and postural drainage.
- ✓ Collect the child's medical history; certain conditions with increased ICP and spinal cord injuries, contra indicate the positional change to postural drainage.
- ✓ Know the child's cognitive level of functioning.
- ✓ Beware of child's exercise tolerance.

Procedure:

12. If the child and family are not familiar with chest physiotherapy, explain the procedure to them using developmentally appropriate language.

13. To provide a basis for determining response to the treatment, assess the child's baseline respiratory status before beginning the procedure. Before the treatment, ask the child to cough or suction the trachea to remove secretions that may have accumulated in the trachea.
14. The child should be dressed in lightweight shirt or gown covering the chest.
15. Place the child in a ***postural drainage*** position.
16. ***Percussion***: Gently but firmly clap the chest wall with cupped hands. A "popping", hollow sound should be the result, not a slapping sound.
17. ***Cough stimulation***: Child can be asked to cough. The child should be advised to cough out while the hand of the operator reinforces anticipated cough by synchronously compressing the lower half of the chest.
18. Collect the sputum in a container.
19. ***Deep breathing***: Encourage the child to take deep breathe through *pursed lips*. Inhale through the nose while counting to 3, then purse the lips as like blowing a whistle and then asked to breathe out gently through pursed lips for 6 counts.
20. *Assisting with tactile sense*: Place the hand over the child's chest where the muscular movement is desired and the child is encouraged to concentrate on expanding that part of chest under the placed hand.
21. Expiration after these deep breaths will often stimulate coughing. Assist with removal of secretions if needed.
22. Reposition the child as needed to complete the procedure, maintaining each position for approximately 5 to 10 minutes.

APPENDIX-VIII

INCENTIVE SPIROMETRY EXERCISE

Incentive spirometry:

Incentive devices use the principle of sustained maximal inspiration (SMI) and incentive spirometry is a technique used to encourage the patient to take a maximal inspiration and to measure a flow or volume. A maximal inspiration sustained over three seconds may increase the transpulmonary pressure thereby improving inspiratory volumes and inspiratory muscle performance. When the procedure is repeated on a regular basis, airway patency may be maintained and lung atelectasis prevented and reversed.

Incentive spirometry approximately resembles to natural sighing or yawning thereby encourages the patient to take long, slow, deep breaths. It is fulfilled by the use of incentive spirometer which helps the children to visualize and gives positive reinforcement which also act as a form of play.

Definition:

An incentive spirometer is a device which measures deep breaths that expand lungs & helps to prevent pulmonary complications after surgery.

Procedure:

1. Assemble Incentive spirometer unit:
    - Remove all parts from plastic bag.
    - Attach mouthpiece to one end of wide-boring tubing and attach other end of tubing to large bore fittings on spirometer.
2. Explain the procedure to the child according to the level of understanding.
3. Sit on the edge of the bed if possible, or sit up as far as the child can in bed.
4. With the unit in an upright position, exhale normally & then place the lips tightly around the mouthpiece.
5. Inhale as deeply and slowly as possible from the mouthpiece.
6. Continue to hold for three seconds.
7. For a low flow rate: Inhale at a sufficient rate, raise only the ball in the first chamber while the second chamber ball remains in the rest position.
8. For a high flow rate: Inhale at a rate sufficient to raise the first & second chamber balls while the third chamber ball remains in rest position.
9. Relax, remove mouthpiece and let air out into the room.

10. Rest for a few seconds and repeat exercise.
11. Each treatment should consist of atleast ten deep inhalations, followed by three to five normal breathing cycles.
12. After each set of 10 deep breaths, practice coughing to be sure the lungs is clear. Support the incision when coughing by placing a pillow firmly against it.
13. Have child rest as needed.