Effect of Inspiratory Muscle Training Program on Health Outcomes among Patients with Thoracic Surgery

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Abstract

Background: Inspiratory muscle training is a targeted strengthening of the inspiratory muscles through the application of resistance during inspiration. **Aim of this study:** Was to evaluate effect of inspiratory muscle training program on health outcomes among thoracic surgeries patients. **Research design:** A quasi - experimental research design was utilized to meet the aim of this study. **Setting:** The study was conducted in Thoracic Surgery Department at Benha University Hospital which consists of 5 rooms, 26 beds**. Sample:** A purposive sample of 80 adult patients undergoing thoracic surgery who met the inclusion criteria enrolled to this study. **Tools of data collection:** Three tools were used: Tool I: Structured questionnaire assessment. Tool II: Observational checklist. Tool III: The clinical outcome assessment. **Result**s: There was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training at pre, post and follow-up implementation of a training program at (P= < 0.01) ,there was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training and patients outcome at pre, post and follow-up implementation of a training program at (P= < 0.01). **Conclusion:** Patient's knowledge and practice were poor at pre-program phase while it had been improved during post program phases (immediate & after 1months) which reflects that training program was effective and had a positive impact on patient's performance regarding patient status observed as (P value at ≤ 0.01).**Recommendation:** The study should be replicated on large sample & different hospitals setting in order to detect and generalize the results.

Key words: Inspiratory muscle training program, health outcomes among patients, thoracic surgery.

Introduction

Thoracic surgery focuses on the chest organs, including the heart, lungs (cardio pulmonary system), esophagus, trachea, pleura, mediastinum, chest wall, and diaphragm. Examples on thoracic Surgery are: Pneumectomy, lobectomy, thymectomy. Technological advances have increased the safety and availability of these complex surgical procedures .Lung cancer surgeries ,heart transplants and anti –reflux surgeries save and improve lives around the world .About 80% of thoracic surgery involves surgery for some sort of cancer .This includes such tumors as lung cancer ,esophageal cancer ,tumors of the chest wall. **(Janne et al, 2021)**

Respiratory Muscle Training (RMT) can be defined as a technique that aims to improve the function of the respiratory muscles through specific exercises. Inspiratory muscle training in particular has been shown to improve respiratory muscle function and might help to reduce dyspnea

on exertion .RMT is normally aimed at people who have respiratory conditions such as asthma ,bronchitis ,emphysema and Chronic Obstructive Pulmonary Disease . **(Pereira, et al., 2019).**

Inspiratory muscle training is a targeted strengthening of the inspiratory muscles through the application of resistance during inspiration. a recent systematic review has shown that IMT in ICU patients has been conducted using whole body training ,resistive loading ,or threshold loading .IMT can be performed in both Ventilator dependent and independently breathing ICU patients and ideally is conducted with the patient in an upright sitting position **(Varona et al.,2018).**

In post-operative care , the nurse must encourage patient to participate in breathing exercises, once patient is extubated , patient also will be asked to communicate his pain level with nurse so that medication can be adjusted if necessary. It is very important for patient to breathe deeply and cough (against a firm pillow) frequently after surgery because lungs were not being inflated and deflated while patient on the heart-lung machine during the procedure. Taking deep breaths can help lungs fully inflate and will help prevent complications like pneumonia or fluid build-up around them. Once patient is ready, nurse will help him out of bed to a chair and start walking. Early activity is important to help reduce surgical complications, such as pneumonia, blood clots in legs, and muscle weakness **(Robbin and Fanning, 2017).** So the aim of this study was evaluated effect of inspiratory muscle training Program on health outcomes among thoracic surgeries patients.

Significance of the study:

Thoracic surgical patients had a greater occurrence of pulmonary complications in postoperative phase which remain a leading cause of postoperative morbidity and mortality that lead to increase costs and prolong hospital stay. So, they require intensive respiratory management post operative by using inspiratory muscle training aims to increase Functional Residual Capacity (FRC), strength of inspiratory muscles, total lung capacity increase and preventing post- operative pulmonary complications **(Stephens, 2013).**

Respiratory diseases are leading causes of death and disability in the world, about 334 million people suffer from asthma, pneumonia kills millions of people annually. In Egypt 2018, reported most common postoperative pulmonary complication was atelectasis that occurred in (3.86%) patients, pneumonia (0.58 %) patients and acute respiratory distress syndrome (0.19%) patients. Non Communicable Diseases (NCDs), including cardio vascular diseases, diabetes, cancer and chronic respiratory diseases are currently the leading national cause of death in Egypt. NCDS are estimated to account for 82% of all deaths in Egypt and 67% of premature deaths **(Sean and Feng, 2018).**

According to statistical office in Benha University hospital, (2019). The number of patients performed thoracic surgeries was (100) from the period of Jan 2019 to Dec.2019. So this study would be conducted to study effect of inspiratory muscle training program on health outcomes among patients with thoracic surgery.

Aim of the study:

This study aimed to evaluate effect of inspiratory muscle training program on health outcomes among patients with thoracic surgery.

Research hypotheses:-

H1: The mean knowledge score of patients with the thoracic surgery post training program were higher than before.

H2: The mean practice score of patients with the thoracic surgery post training program were higher than before.

H3: The health outcomes of patients with the thoracic surgery who are exposed to training program were improved .

Subject and methods

Research design:

A quasi - experimental research design was utilized to meet the aim of this study.

Setting:

The study was conducted in thoracic surgery department at Benha University Hospital. The thoracic surgery department was consist of 5rooms including 26 beds.

Sample:

A purposive sample of 80 adult patients undergoing thoracic surgery who met the inclusion criteria enrolled to this study.

Tools of data collection: Data was collected using the following tools:-

Tool (I): Structured questionnaire assessment:

This tool was developed by researcher based on recent literature review, it was presented in simple Arabic language and included four parts:

part (1): Patient`s demographic data: This part was concerned with assessment of patients demographic characteristics related to age, sex, marital status, educational level and occupation.

Part (2): Health data assessment : it aimed to assess present patient's health history and was included questions related to diagnosis ,type of thoracic surgery ,date of admission ,date of operation ,past medical history included (heart disease ,diabetes mellitus, chronic obstructive pulmonary disease (COPD), hyper tension , bronchial asthma, liver disease, kidney disease ,blood disorders, cancer ,smoking history and tuberculosis) and past surgical history included (abdominal operation, neuro surgical operation, orthopedic operation, tonsillectomy ,thyroidectomy and piles).

Part (3): Anthropometric measurements assessment: It aimed to assess body mass index of patient. This part as weight, height and body mass index.

**Part (4): Patient`s knowledge questionnaire (pre /post program):**it was developed by the researcher after reviewing the related literature **(Varona, et al, 2018 and Alana, 2017)** ,it was aimed to assess patient`s knowledge regarding surgery and inspiratory muscle training ,it was composed of 12 closed end questions .

Scoring system for knowledge questionnaire: the right complete answer was given (2) score, incomplete correct answer was given (1) score and I don't know give (0) score with total score was (24). The scores were summed –up and converted into percent score . it was categorized as follow:-

Score < 60% was considered" un satisfactory level of knowledge".

Score >= 60%was considered "satisfactory level of knowledge".

Tool (II) Observational checklist :- It was included two parts:

Part (1) practical part:

It was adopted from **(Voldyne, 2001 and Alana,2017)** it was used to assess patient`s practices related of inspiratory muscle training ,it included main six inspiratory muscle training techniques as following :

- Diaphragmatic breathing technique which included (4steps).
- Incentive spirometer technique included (8steps) .
- Apical costal expansion technique included (4steps).
- Lateral costal expansion technique included(4steps).
  Posterior costal expansion technique included (7steps) .
- Huff coughing technique included (6steps).

Scoring system for practical part: the right complete technique was given (2) score, incomplete correct technique was given (1) score and don't know technique give (0) score with total score was (66). The scores were summed –up and converted into percent score**.**

Score< 60% was considered un satisfactory to level of performance.

Score >=60%was considered satisfactory to level of performance.

Part (2): Analogue Manometer Test:

This tool was used to assess prognosis of patient at discharge .This part developed by **American Thoracic Society (2002)** it aimed to to assess Maximum Inspiratory Pressure (MIP) was used as an instrument designed for rapid assessment of inspiratory and expiratory muscle strength ,normal value in female 2.5-3.25,in male 3.5-4.5 liter and it consists of (clip on nose ,patient takes a deep breath and blows as hard as through tube in Spirometer).

Tool (III): The clinical outcome assessment:- it was adopted from **(Bradley, 2012)** this tool was used to assess the clinical outcome of the inspiratory muscle training and it included two parts :

Part (1): Clinical baseline data :to assess vital signs ,length of hospitalization, tidal volume ,total lung capacity.

Part (2): post-operative complications: this tool was developed by the researcher based on the reviewing of the related literature **(Bradley,2012)** it aimed to assess post operative pulmonary complication which included the following :

- Period of incidence of post –operative pulmonary complications.
- Duration of post –operative mechanical ventilation.
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Tools validity &reliability:-

Content Validity:

Test face and content validity of the suggested tool through panel of expert's opinion (a group of five experts) one professor, three assistant professor of Medical Surgical Nursing of Faculty of Nursing, Benha University and one assistant professor from Thoracic Surgery department of Benha University. Their opinions were elicited regarding the content, format, layout ,consistency, accuracy and relevancy of the tool according to their opinion minor modifications were applied.

Tool Reliability:-

The reliability was testing statistically to assure the tools were reliable before data collection: testing the reliability of the tools through Cronbach's alpha test reliability analysis .

- Cronbach's alpha for knowledge scoring system for knowledge questionnaire: 0.73
- Cronbach's alpha for observational check list scoring system for practical part: 0.82
- Cronbach's alpha for clinical outcome assessment : 0.79

Ethical Consideration:-

The research approval was obtained from scientific research ethical committee in the faculty of nursing at Benha University before starting the study.

Verbal and written consent was obtained from the patients to participate in the study after explaining the purpose of the study.

Confidentiality and privacy was assured.

Patients was informed that they are allowed to choose to participate or not in the study and they have the right to with draw from the study at any time.

Ethics, values, culture, and beliefs was respected.

Pilot study:

Pilot study was conduct on 10 % of the total sample in order to evaluate the applicability of the study .As well as to estimate the time needed for data collection, according to the results obtained from data analysis , items connection , modification and addition will be done as needed. The patients involved in the pilot study were excluded from the study sample.

Field work:

Data collection of the study was carried out through six months from the beginning of March month till the end of September month 2020.

In this phase: the beginning with, introduce my self and purpose of the study. Then explain the theoretical part contain on thoracic surgery definition , indication , post –operative pulmonary complication in session 1 and definition of IMT in session 2 .Explain the practical part in session 2 and session 3. IMT was taught to all patients pre operatively in three sessions on every other day ,each session has been taken a duration of 10 min and was given to 4 to5 patients ,inspiratory muscle training (diaphragmatic breathing exercises (4 steps) , incentive spirometry(8 steps) , apical costal expansion(4 steps) , lateral costal expansion(4 steps) , posterior costal expansion(7 steps) and huff coughing exercises(6 steps)) was demonstrated by the researcher and then re demonstrated by the patient until the patient was performing the technique correctly.

- The total number of sessions were three sessions:

  Session I: Thoracic surgery definition, indication and post –operative pulmonary complications .

  Session II: Definition of IMT and techniques of inspiratory muscle training which include (diaphragmatic breathing exercises, incentive spirometer (IS).

  Session III: segmental breathing exercises which includes, apical costal expansion exercises, lateral costal expansion exercises, posterior costal expansion exercises and huff coughing exercises).

Discussion, motivation and reinforcement during the intervention sessions were used to enhance learning, teaching media using booklet, lab top , pictures and video.

Statistical analysis:

The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (X) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (X^2). Different between the group during the two visits were assessed by paired t test and Different between the group during the three visits were assessed by repeated measures

ANCOVA. In addition, r -test were used to identify the correlation between the study variables.

Degrees of significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value ≤ 0.05 Significant (S)
- P-value ≤ 0.01 Highly Significant (HS).

Results:

Table (1): Demonstrates distribution of the studied patients according to their demographic data. It shows that, 50% of the studied patients their age ranged between 25-< 35 years with mean 35.3± 4.08 SD. Related to gender and marital status, 63.7% and 58.7% respectively of the studied patients were male and married respectively. In addition, 27.5% of the studied patients had university education. Regarding to occupation, 63.7% of them were employer.

Table (2): Illustrates number and percentage distribution of the studied patients according to their clinical data. Regarding present medical and surgical history, 52.5% of the studied patients diagnosed with lung cancer and 66.2% of the studied patients hospitalized in less than a week. In addition, 36.3% of the studied patients underwent a pneumonectomy. Moreover, 50% of the studied patients were smoking, 65% of them smoking from less than 15 years and 50% of them smoking ≥ 15 cigarettes per day. In addition, 47.5% of the studied patients had previous surgical history of abdominal operations.

Figure (1): Shows that, 92.5% of the studied patients had unsatisfactory level of total knowledge about thoracic surgery and inspiratory muscle training at pre implementation of a training program. While after program implementation, 86.3% of patients had satisfactory level of total knowledge. In addition, 55% of patients had satisfactory level of total knowledge at follow-up implementation of a training program.

Figure (2): Shows that, 82.5% of patients had unsatisfactory level of total practice of inspiratory muscle training at pre implementation of a training program. While after program implementation, 86.3% of patients had satisfactory level of total practices. In addition, 60% of patients had satisfactory level of total practice at follow-up implementation of a training program.

Table (3): Shows that, there was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training at pre, post and follow-up implementation of a training program at (P= < 0.01).

Table (4): Shows that, there was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training and patients outcome at post and follow-up implementation of a training program at (P= < 0.01).

Table (1): Number and percentage distribution of the studied patients according to their demographic data (N=80).

Frequency	N	%
demographic data		
Age (Year)		
20-< 25	0	0.0
25-< 35	**40**	**50**
35-< 45	29	36.2
45-< 55	11	13.8
Mean ±SD **35.3± 4.08 SD**		
Gender		
Male	**51**	**63.7**
Female	29	36.3
Marital status		
Married	**47**	**58.7**
Single	12	15
Widow	10	12.5
Divorced	11	13.8
Education Level		
Illiterate	4	5
Primary education	18	22.5
preparatory education	16	20
Secondary education	20	25
University education	**22**	**27.5**
Occupation		
Housewife	18	22.5
Employer	**51**	**63.7**
Manual work	0	0.0
free work	11	13.8

Table (2): Number and percentage distribution of the studied patients according to their clinical data (N=80).

Frequency	N	%
Present medical & surgical history		
Diagnosis		
Lung cancer	**42**	**52.5**
Lung infections	18	22.5
Hemothorax	12	15
Other	8	10
Date of admission		
Less than a week	**53**	**66.2**
More than a week	27	33.8
Surgery type		
Pneumonectomy	**29**	**36.3**
Lobectomy	20	25
Resection of an adenoma	22	27.5
Thoracentesis	0	0.0
Removal of a tumor in the chest wall	9	11.2
Previous medical history		
History of chronic diseases		
Diabetes	20	25
Heart disease	9	11.2
Chronic obstructive pulmonary disease	18	22.5
Cancer	**22**	**27.5**
Tuberculosis	11	13.8
Smoking		
Yes	**40**	**50**
No	40	50
If yes, smoking period (n=40)		
Less than 15 years	**26**	**65**
Over 15 years old	14	35
Number of cigarettes per day (n=40)		
5-<10	10	25
10-<15	10	25
≥ 15	**20**	**50**
Previous surgical history		
Abdominal operations	**38**	**47.5**
Neurosurgery	0	0.0
Bone operations	11	13.8
Tonsillectomy	20	25.0
Thyroidectomy	0	0.0
Hemorrhoids	11	13.8

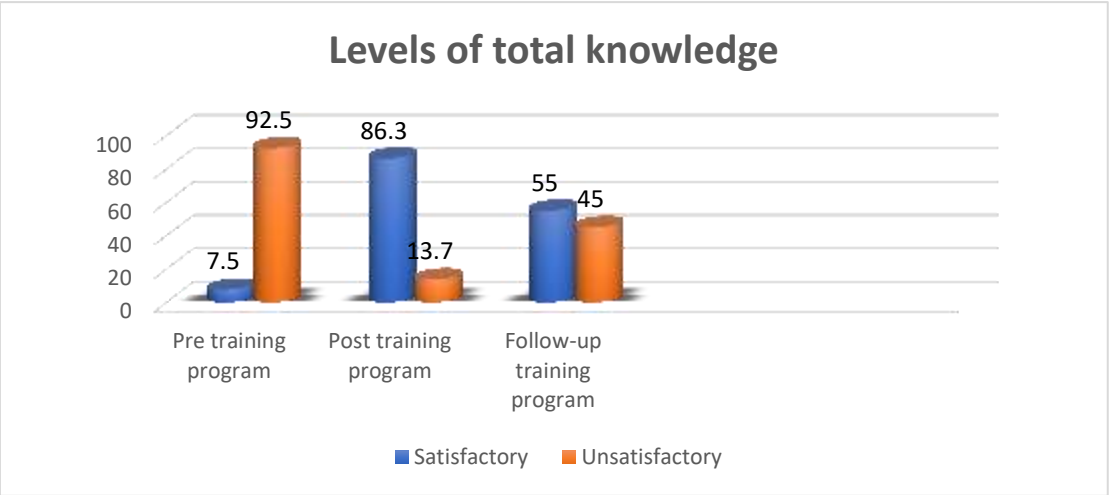

Figure (1): Distribution of the studied patients regarding their levels of total knowledge about thoracic surgery and inspiratory muscle training at pre, post and follow-up implementation of a training program

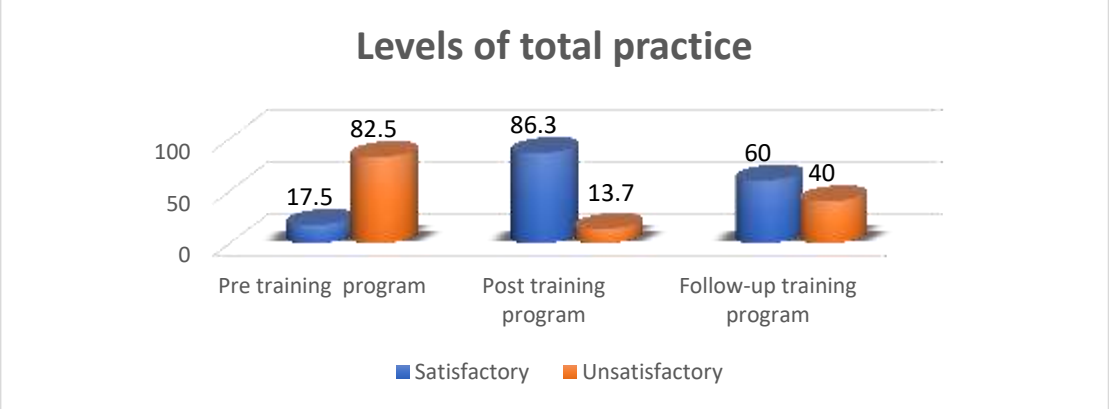

Figure (2): Distribution of the studied patients regarding their levels of total practice of inspiratory muscle training at pre, post and follow-up implementation of a training program (n=80).

Table (3): Correlation between total patients' knowledge scores about thoracic surgery and inspiratory muscle training and their total practices scores at pre, post and follow-up implementation of a training program (n=80).

****highly significant at p ‹ 0.01.**

		Total practice		
		Pre- a training program	**Post- a training program**	**Follow-up - a training program**
Total knowledge	**R**	.833	.553	.509
	p	.000**	.000**	.000**

Table (4): Correlation between total patients' knowledge scores and total practices scores and patients outcome at post and follow up implementation of a training program (n=80).

Variables	Total knowledge				Total practice			
	Post training program		One month post training program		Post training program		One month post training program	
Maximum Inspiratory Pressure								
	r	P	r	P	R	P	r	P
Female	.510	.000**	.405	.000**	.519	.000**	.403	.000**
Male	.506	.000**	.455	.000**	.500	.000**	.418	.001**
Vital signs								
	r	P	r	P	R	P	r	P
Temp	.501	.000**	.450	.000**	.527	.000**	.425	.000**
Pulse	.351	.005**	.340	.005**	.374	.004**	.367	.005**
Respiration	.517	.000**	.410	.000**	.526	.000**	.417	.000**
Blood Pressure	.361	.005**	.326	.007**	.340	.005**	.337	.005**
Tidal Volume	.508	.000**	.407	.000**	.399	.001**	.390	.001**
Total lung capacity	.350	.005**	.339	.005**	.334	.006**	.323	.007**

****highly significant at p ‹ 0.01.**

Discussion

The current study revealed that, half of the studied patients their age ranged between 25-< 35 years with mean 35.3± 4.08 years. From the researcher's point of view, it may be due to the studied patients were had psychological stress and anxiety .Long –term anxiety or emotional stress could increase the risk for sudden death and because the youth patient more liable for anxiety than others. This was in agreement with that of **Alaparthi et al ., (2013)** , whose study was about " Inspiratory muscle rehabilitation in critically ill adult " who founded that the average age of studied patients was 30 years old , and this finding was on the same line with **Molassiotis et al., (2015)** whose study was about " The effect of resistance inspiratory muscle training in the management of breathlessness in patients with thoracic malignancies" , Journal of Support Care Cancer, concluded that the age of their studied patients was 30 years , but this result was in disagreement with that of **Granger et al ., (2013)** , whose study was about " Safety and feasibility of an exercise intervention for patients following lung resection: a pilot randomized controlled trial " , Journal of Integral Cancer Therapy ,who concluded that age of their studied patients was 65 years. This may be due to increased age had decreased lung compliance and decreased respiratory muscle strength. Also, this result disagreed with **Eleter et al.,(2016)** who studied "Effect of inspiratory muscle training on clinical outcomes of patients undergoing cardiothoracic surgeries" , IOSR Journal of Nursing and Health Science ,reported that the mean age of study patients was 42.40±10.66 .

The present study revealed that the nearly two thirds of the studied patients were males. This may be due to the Egyptian culture in which man is responsible about family members and financial resources which put him in a high stress. This finding agreed with **Mills, (2018)** whose study was about "Identification of preoperative risk factors for postoperative pulmonary complications after thoracic and abdominal surgery" reported that most of study patient was male. Also, this finding was consistent with **Granger et al.,(2013)** who stated that nearly half of the studied sample were males.

In contrast, this finding is in disagreement with **Eleter et al.,(2016)** who founded that the majority of the studied sample were females. Also, this result disagreed with **Cader et al. (2010)** who studied "Inspiratory muscle training improves maximal inspiratory pressure and may assist weaning in older intubated patients",Journal of Physiotherapy, observed that more than half of the studied patients in their study were females.

Concerning marital status, the present study finding revealed that the more than half of studied patients were married. From the present study researcher's point of view, it may be due to the married people were had family responsibilities, work pressure and continuous thinking which in turn lead to many healthy problems. This finding was in consistence with that of **Mills, (2018)** who reported that most of study patient was married. Also, agreed with **Eleter et al.,(2016)** who documented half of the studied patient in his study were married and was in accordance with **Ellis et al, (2012)** whose study was "Considerations in developing and delivering a non-pharmacological intervention for symptom management in lung cancer", Journal of Pain and Symptom Management, founded that more than half of the studied patients were married.

In respect to the level of education, the result of the present study revealed that more than one quarter of studied group had university education and one quarter had secondary education. This result agreed with **Eleter et al.,(2016)** who documented less than half of the studied sample had secondary education. But this finding was disagreed with **Molassiotis et al., (2015) and Ellis et.al, (2012)** who reported that majority of the studied groups had secondary education.

Concerning employment, the finding of the present study was revealed that more than half of studied group were employer. From the researcher's point of view, it may be due to most employer had stress in work and responsibility which in turn lead to many healthy problems .This finding was online with that of **Avila, (2017)** whose study was about " Incidence and risk factors for postoperative pulmonary complications in patients undergoing thoracic and abdominal surgeries", revealed that, the more than half of patients were employer. This finding was in disagreement with **Ellis et.al, (2012)** who reported that majority of studied sample were retired.

Regarding to present medical and surgical history:-

As regards to diagnosis, the current study results revealed that, more than half of the studied patients diagnosed with lung cancer. This finding is on line with that **Eleter et al.,(2016)** who noticed that one fifth of the study patients had a diagnosis of lung cancer.

As regards to hospitalization, the current study findings revealed that more than half of the studied patients hospitalized in less than a week, this finding is on line with **Elkins and Dentice (2015)** who studied "Inspiratory muscle training facilitates weaning from mechanical ventilation among patients in the intensive care unit: a systematic review", J Physiother , reported that mean of hospitalization was 4.4 days.

As regards to surgery type, the current study findings revealed that less than half of the studied patients underwent a pneumonectomy .From the researcher's point of view, it may be due to lung cancer was the most common reason for pneumonectomy, healthcare providers usually tried to remove as little as possible of the lung tissue, this finding is on line with that of that of **Kor and Warner,(2018)**, whose study was about" Role of diaphragmatic breathing and aerobic exercise in improving maximal oxygen consumption" who reported that less than half of studied patients underwent a pneumonectomy.

As regards to chronic diseases, the current study findings revealed that the nearly one quarter of studied patient had cancer , this finding is on line with that of **Howell and Sear, (2019),** whose study was about" Hyper tension, hypertensive heart disease and perioperative cardiac risk", who reported that one quarter of studied patient had cancer.

Concerning smoking, the present study showed that about half of studied patients were smokers. From the researcher's point of view, it may be due to two thirds of patients were males .This finding is on line with that of **Mills , (2018)**,who reported that half of studied patients were smokers. Also, this result agreed with **Brocki et al.,(2016)** who studied "Postoperative inspiratory muscle training in addition to breathing exercises and early mobilization improves oxygenation in high-risk patients after lung cancer surgery: a randomized controlled trial ", European Journal of Cardio-Thoracic

Surgery ,founded that most of study patient was smokers.

As regards to previous surgical history , the current study results revealed that half of the studied patients had previous surgical history of abdominal operations. this finding is on line with that of **Condon ,(2013)** , whose study was about" General and Abdominal surgery", who reported that, half of studied patients had previous surgical history of abdominal operations.

As regard to total patient's knowledge, the present study revealed that most of the studied patients had unsatisfactory level of total knowledge about thoracic surgery and inspiratory muscle training at pre implementation of a training program. While after program implementation, majority of patients had satisfactory level of total knowledge. In addition, half of patients had satisfactory level of total knowledge at follow-up implementation of a training program. From the researcher's point of view, this satisfaction might be related to inspiratory muscle training had a beneficial effect on inspiratory muscle strength and this finding reflects that program had positive impact on improving patient' knowledge .This finding was on line with that of **Ebraheim., (2016)** whose study was about" Effect of educational guidelines on cardiac self efficacy ,health complaints and anxiety level among patients with coronary artery disease ", at A syut University Hospitals, in an unpublished master thesis ,reported after program implementation ,majority of patients had satisfactory level of total knowledge about thoracic surgery and inspiratory muscle training.

On the same line **Amin, (2021)** whose study was about " Effect of three pulmonary ventilation regimes in patients undergoing coronary artery bypass graft surgery" who found that , most of the studied patients had unsatisfactory level of total knowledge about thoracic surgery and inspiratory muscle training at pre implementation of a training program.

As regard to patient's total practice of inspiratory muscle training at all phases of a training program, the present study revealed that majority of patients had unsatisfactory level of total practice of inspiratory muscle training at pre implementation of a training program .While after program implementation, most of them had satisfactory level of total practices. In addition, more than half of patients had satisfactory level of total practice at follow-up implementation of a training program. From the researcher's point of view, this satisfaction might be related to inspiratory muscle training had a beneficial effect on inspiratory muscle strength and this finding reflects that program had positive impact on improving patient' practice. This finding is on line with that of **Othman., (2016)**, who reported that, majority of patients had unsatisfactory level of total practice of inspiratory muscle training at pre implementation .

As regard to correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training at pre, post and follow-up implementation of a training program, the current study revealed that ,there was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training at pre, post and follow-up implementation of a training program at (P= < 0.01), which indicated that education could significantly affect practice, this finding is consistent with that of **Elbehairy., (2016),** whose study was about "Physiological and clinical relevance of exercise ventilator efficiency in COPD" ,at Asyut University Hospitals, in an

unpublished master thesis, who stated that, there was highly significant positive correlation between total patients' knowledge and their practice towards thoracic surgery and inspiratory muscle training .

As regard to correlation between total patients' knowledge , practice and patients outcome at pre, post and follow-up implementation of a training program, the current study revealed that, there was highly significant positive correlation between total patients' knowledge, practice towards thoracic surgery and inspiratory muscle training and patients outcome at pre, post and follow-up implementation of a training program at (P= < 0.01), this finding is consistent with that of **Ebraheim., (2016),** who stated that, there was highly significant positive correlation between total patients' knowledge, practice towards thoracic surgery and inspiratory muscle training and patients outcome .

Conclusion

Patient's knowledge and practice were poor at pre-program phase while it had been improved during post program phases (post & after 1months) which reflects
that training program was effective and had a positive impact on patient's performance regarding patient status observed as (P value at ≤ 0.01).

Recommendations

*For Nurse:-Improving thoracic nurse's awareness about their vital role in the achievement of the training program.

*For further research:-The study should be replicated on large sample & different hospitals setting in order to detect and generalize the results.

*Written ,colored simple booklet about Inspiratory muscle exercise should be provided and be available for all patient in chest department.

Reference

Alana Biggers.(2017). Inspiratory muscle training to enhance recovery from mechanical ventilation:arandomised trial,Thorax;71:812-819

Alaparthi ,A., Varvogli ,L., Darvini ,C and Laurino,M. (2013). Inspiratory muscle rehabilitation in critically ill adult. Health Science Journal.5(2):74-89.

American Thoracic Society/European Respiratory Society .(2002). ATS/ERS Statement on respiratory muscle testing, AMJ RespirCrit care Med ;166:18-624.

Amin ,R. (2021). Effect of three pulmonary ventilation regimes in patients undergoing coronary artery bypass graft surgery:a randomized clinical trial ,European Journal of Cardio-Thoracic Surgery.11(2):6725-6730.

Avila, A.C., Fenili, R. (2017). Incidence and risk factors for postoperative pulmonary complications in patients undergoing thoracic and abdominal surgeries. Rev col Bras cir ; 44: 284-92.

Bradley, E.(2012). Post-operative out comes following preoperative inspiratory muscle training in patients undergoing open cardio thoracic or upper abdominal surgery. Systemic review Journal, 1(5).1-63.

Brocki, B., Andreasen, J ., Langer, D ., and Souza, D.(2016). Postoperative inspiratory muscle training in addition to breathing exercises and early mobilization improves oxygenation in high-risk patients after lung cancer surgery: a randomized controlled trial,European Journal of Cardio-Thoracic Surgery, Volume 49, Issue 5Pages 1483–1491.

Cader SA, Vale RG, Castro JC and Bacelar SC (2010). Inspiratory muscle training improves maximal inspiratory pressure and may assist weaning in older intubated patients. Journal of Physiotherapy.; 56 (7): 171- 77.

Condon,R. (2013). General and Abdominal surgery .Physiotherapy:36(3):121-140.

Ebraheim, S.K. (2016). Effect of educational guidelines on cardiac self efficacy ,health complaints and anxiety level among patients with coronary artery disease , at Asyut University Hospitals, thesis submitted for partial fulfillment of master degree in medical –surgical nursing ,faculty of nursing , Asyut University.

Elbehairy, N.E. (2016). Physiological and clinical relevance of exercise ventilator efficiency in COPD ,at Asyut University Hospitals, thesis submitted for partial fulfillment of master degree in medical – surgical nursing ,faculty of nursing , Asyut University.

Eleter,N., Basal,A., El-Azazy, H. andElmetwaly,E.(2016). Effect of Inspiratory Muscle Training on Clinical Outcomes of Patients Undergoing Cardiothoracic Surgeries, IOSR Journal of Nursing and Health Science (IOSR-JNHS) e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 5, Issue 4 Ver. V (Jul. - Aug. 2016), PP 92-106.

Elkins,M. and Dentice, R. (2015). Inspiratory muscle training facilitates weaning from mechanical ventilation among patients in the intensive care unit: a systematic review, J Physiother :61(3):125-34.

Ellis J, Tishelman C, Bailey Ch and Lorigan P. (2012). Considerations in Developing and Delivering a Non-pharmacological Intervention for Symptom Management in Lung Cancer: The Views of Patients and Informal Caregivers. Journal of Pain and Symptom Management. 44(6):831-40.

Granger , C.,Chao, C., McDonald ,C., Berney,. S and Denehy, L.(2013). Safety and feasibility of an exercise intervention for patients following lung resection: a pilot randomized controlled trial. Journal of Integral Cancer Therapy. 12(3): 213- 24.

Howell, S.J., Sear, J.W. (2019). Hyper tension, hypertensive heart disease and perioperative cardiac risk. Br J Anaesth; 92: 570-83.

Janne, P.A., Baik ,C.S., Suwc.(2021). Efficacy and safety of patritumab deruxtecan in non –small cell lung cancer .J Clin Oncol ;39(15) :9007-9010.

Kor, D.J., Warner, D.O. (2018). Role of diaphragmatic breathing and aerobic exercise in improving maximal oxygen consumption. Anesthesiolog ; 101: 132-137.

Mills, G.H. (2018). Respiratory complications of anaesthesia. Anaes thesia; 73: 25-33.

Molassiotis A, Charalambous Aand Taylor P. (2015).The effect of resistance inspiratory muscle training in the management of breathlessness in patients with thoracic malignancies. Journal of Support Care Cancer.; 23: 1637- 45.

Othman,E.M. (2016). Resisted breathing exercise versus incentive spirometer training on vital capacity in post operative radical cystectomy cases ,at Sohag University Hospitals, thesis submitted for partial fulfillment of master degree in medical – surgical nursing ,faculty of nursing , Sohag University.

Pereira ,M.C., Dacha,S.,Langer,D.(2019). Assessing the effects of inspiratory muscle

training in a patient with unilateral diaphragm dysfunction . Chest ;15(2):0-6.

Robbin, and Fanning, M.F.(2017). Reducing postoperative pulmonary complications in cardiac surgery patients with the use of the best evidence, J Nurs Care Q ,19:95-99.

Sean,M., and Feng, L.(2018). Multiple bio markers for the prediction of first major cardio vascular events and death. An thorac surg;105(5):1419-1428.

Stephens, R.S .(2013). Relationship between respiratory muscle strength ,functional capacity and quality of life in pre operative cardio surgery patients . An thoracsurg ; 95 (3) : 11-22.

Varona, S., Sabatini, U., Al-Maqbali ,S. and Bertoni ,M. (2018). Inspiratory muscle rehabilitation in critically ill adult :a systematic review and meta-analysis. Ann Am ThoracSoc ;15(6):44-735.

Voldyne, USA.(2001). The efficacy of postoperative incentive spirometry is influenced by the device –specific imposed work of bre athing ,Chest ;119:64-18

تأثير برنامج تدريب العضلات الشهيقية علي المخرجات الصحية للمرضى الذين يخضعون لجراحة الصدر

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تدريب العضلات الشهيقية هو تقوية مستهدفة للعضلات من خلال تطبيق المقاومة أثناء الشهيق. لذلك هدفت هذه الدراسه الي تقييم تأثير برنامج تدريب العضلات الشهيقية على النتائج الصحية بين مرضى جراحة الصدر. وقد أجريت هذه الدراسة بقسم جراحة الصدر بمستشفى بنها الجامعي ويتكون من ٥ غرف و ٢٦ سريراً يوجد بالدور الثالث مبني الباطنة علي ٨٠ مريضًا بالغًا يخضعون لجراحة الصدر بمستشفى بنها الجامعي. حيث كشفت النتائج عن أن هناك تحسنًا ملحوظًا في الحد الأقصى للضغط التنفسي لدى المرضى بعد تنفيذ برنامج تدريبي مع وجود فرق كبير إحصائيًا عند التنفيذ السابق واللاحق والمتابعة لبرنامج التدريب. فيما يتعلق ببيانات الإكلينيكيه للمرضى ، كشفت الدراسة الحالية أنه كان هناك تحسن ملحوظ في البيانات السريرية للمرضى بعد تنفيذ برنامج تدريبي مع وجود فروق ذات دلالة إحصائية عالية بين ما قبل وبعد مباشرة. ومتابعة تنفيذ برنامج تدريبي. كان هناك انخفاض ملحوظ في المضاعفات المبكرة بعد الجراحة لدى المرضى بعد تنفيذ برنامج تدريبي. بالإضافة إلى ذلك ، كان هناك انخفاض ملحوظ في مضاعفات ما بعد الجراحة المتأخرة للمرضى بعد تنفيذ البرنامج التدريبي. كانت هناك علاقة إيجابية ذات دلالة إحصائية بين المعرفة الكلية للمرضى وممارستهم نحو جراحة الصدر وتدريب العضلات الشهيقية ونتائج المرضى في تنفيذ البرنامج التدريبي . وأوصت الدراسة بأن زيادة وعي ممرضات الصدر بدورهم الحيوي في تحقيق البرنامج التدريبي للمرضي وتوفير الكتيب عن تمارين العضلات الشهيقية لكل المرضي في قسم جراحة الصدر.