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Original Research Article

Efficacy of Respiratory Exercises on Selected Respiratory Parameters among Post-Operative Laparotomy Patients

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Abstract

The act of inhalation and exhalation is called breathing and the exchange of gases in the lungs the ventilation and perfusion are called respiration. Impaired breathing or any limitation in breathing can lead to various problems, and this limitation or impairment can be due to therapeutic surgeries and general anesthesia. The study aims at efficacy assessment of respiratory exercises on selected respiratory parameters. Recording of the respiratory parameters before and after respiratory exercises was done among post-operative laparotomy patients. Association of the socio-demographic variable with post-exercise respiratory parameter scores was calculated with help of the chi-square test. An experimental research design was adopted and a consecutive sampling technique was used to select 50 subjects. Data was obtained from study subjects with the help of Performa developed consists of Part-A –sociodemographic profile. Part- B – format for recording the measurements of selected respiratory parameters. Part-C – protocol on respiratory parameters. Part- D – Protocol on respiratory exercise. Approval was taken from the research and ethical committee of the institution. Data analysis was done. Result concluded that there was no significant difference between the pretest and post score of the experiment group. It can be due to the smaller sample size (n=25). However, it can be established with a lower sample size. On other hand, the "t" value calculated between control and experiment study reviled significant difference therefore conclusion was drawn that respiratory exercises were effective to bring change in respiratory parameters

Keywords: Respiratory Exercise, Laparotomy, Post-operative, and Nurse led intervention.

INTRODUCTION

The movement of atmospheric oxygen to the cells in the tissues and bringing the carbon dioxide out of them, the process is known as respiration. The physiological definition of respiration is different from the biochemical definition, which refers to cellular respiration i.e. a metabolic process by which an organism obtains energy (in the form of ATP) by oxidizing nutrients and releasing waste products [1]. Post-operative pulmonary complications (PPCs) known as lung complications that develop post-surgery affect nearly 5–10% of patients. It takes six weeks for the respiratory system to gain its preoperative state after undergoing a major surgery under general anesthesia.

The most common types of Postoperative pulmonary complications (PPCs) which may develop are postoperative hypoxemia, atelectasis, bronchospasm, post-operative pneumonia, acute lung injury (ALI) & respiratory failure, and pulmonary embolism. Acute atelectasis is common post-operative complication due to deficiency of surfactant [2].

Apart from that Atelectasis area becomes susceptible to infection leading to post-operative pneumonia (PP). Generally, it develops over the first five postoperative days. The symptoms will include fever, leukocytosis, and an increase in secretions and pulmonary infiltrates other than that. Also, Pneumothorax leads to a collapsed lung, it occurs when air fills the space between your lung and the chest wall. This leads to an inordinate pressure on your lung, the heart, and the large blood vessels around your heart. It is life-threatening and characterized by chest pain and being out of breath. The respiratory failure associated with ALI and/ARDS is linked to the greatest number of post-operation fatalities. It is caused by a hypoxemic respiratory failure, underpinned by substantial lung injury characterized by a decreased capacity for lung compliances. Pulmonary embolism is blood coagulation

that happens in the lungs. It is life-threatening as restricting the blood flow can damage the lungs. It also diminishes the oxygen levels in the blood and large or multiple blood clots can be fatal [3].

Prevention of complications can be done with different modalities. Many validated risk prediction models are available that help in understanding of PPC development; however consensus has yet to be gained for clinical efficacy.

Preventive measures - Control on comorbidities, lifestyle modification like smoking cessation, anemia correction, intraoperative protective ventilation strategies, appropriate use of neuromuscular blocking medications and preoperative respiratory exercise and physiotherapy, lowers atelectasis incidence postoperatively [4, 5].

Deep breathing exercises play a very important role in the prevention of PPC's in post-operatively patients. Deep breathing exercises help in expanding the lungs and force better distribution of air into the lungs. This helps to prevent PPC's and early recovery of the patients [6]. Pursed lip breathing is another great technique used to address breathlessness in those having trouble in trouble associated with respiratory complications [7]. Breathing exercises in general aim to correct breathing errors, re-establish a proper breathing pattern, increased diaphragm activity, elevate association of alveolar ventilation, reduce energy consumption when breathing, and relieve shortness of breath and PPC's experienced by post-operatively patients [8].

The empirical shreds of evidence revealed that the respiratory complications in the postoperative period can be significantly reduced by practicing respiratory exercises however it is not in much practice in the Indian setup. Hence the investigator found it necessary to take a pre-experimental study on the effect of respiratory parameters among post-operative laparotomy patients.

BACKGROUND

Various studies have shown similar effects. For instance, Study conducted on the prevention of respiratory complications after abdominal surgery showed that the incidence of respiratory complications was 15% among the spirometry group and 12% of patients in the deep breathing and coughing exercises group. Similarly, the study was done on the effects of deep breathing exercises on pulmonary function. Atelectasis, ABG levels revealed that performing breathing exercise hourly during the daytime for 1st 4 postoperative days significantly decreases atelectatic areas and improves pulmonary function [4].

Further, a study conducted on lung functions like maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), tidal volume vital capacity, peak expiratory volume has a positive correlation with respiratory exercise. Apart from this lung expansion improves with incentive spirometry, deep breathing exercise significantly reduces the risk of pulmonary complications. Immediate effects of deep breathing exercise have also been found effective in reducing the incidence of atelectasis and improve oxygenation after cardiac surgery [9].

Another study on Breathing exercises in upper abdominal surgery: a systematic review and meta-analysis showed that on the first day post-operative, the breathing exercises were likely to have induced maximum expiratory pressure(MEP) and maximum inspiratory pressure (MIP) improvement [treatment effects of 11.44 mmH2O (95%CI 0.88 to 22) and 11.78 mmH2O (95%CI 2.47 to 21.09), respectively [10]. Breathing exercises are likely to have a beneficial effect on respiratory muscle strength in patients submitted to upper abdominal.

Thus, the effect of respiratory exercise on selected respiratory parameters among post-operative laparotomy patients further was planned.

METHODOLOGY

The research approach adopted in the study was a quantitative experimental research approach. The research was conducted at male surgical wards. The target population was all the post-operative day-1 laparotomy patients. Non- probability, consecutive sampling technique was adopted for sample selection. Fifty post-operative laparotomy patients were selected. Out of which, twenty-five patients were in the experimental group and twenty-five were in the control group. Patients who underwent open laparotomy, willing to participate and Conscious, and able to follow verbal instructions were included in the study. Permission for conducting the research study was taken from the Ethical and Research Committee. Consent was gained in writing from study subjects and confidentiality as well as anonymity too was maintained.

The tool was constructed and verified to collect data from the samples. It was divided into two sections:

Section –A – deals with socio-demographic data
Section-B - recording Performa of scoring of respiratory parameters.

Written Informed consent from the study subjects was taken. The Investigators assessed and recorded the selected respiratory parameters as per the protocols developed. Thereafter investigators demonstrated the respiratory exercises to the study subject as per the protocols developed. The study subject repeated the respiratory exercises thrice a day

for 3 days for 5-8 minutes. The investigator recorded the selected respiratory parameters at end of the 3rd day.

Tool and protocols were given to various experts from the nursing field and medical field for validation.

Reliability was established by using the test re-test method. Data analysis was done in agreement with the objectives of the study using descriptive and inferential statistics, and the analyzed data are presented in the form of tables and graphs.

RESULTS & DISCUSSION

Section A

Distribution of demographic profile

Distribution of identification data in terms of frequency and percentage of age, marital status, and education status

Table-1: Distribution of Demographic profile

Sr. No.	Identification Data		N=50
		FREQUENCY	PERCENTAGE(%)
1	AGE (in years)		
	18-25	14	28
	25-35	14	28
	35-45	10	20
	45-55	8	16
	55-65	4	8
2	Marital Status		
	Married	33	66
	Unmarried	17	34
3	EDUCATION		
	Illiterate	26	52
	Matric	21	42
	Graduate	3	6

Table 1 depicts the maximum (28%) subjects were in the age group of 18-25 and 25-35 years with a mean age of 35.12 years. The majority of subjects were in the age group of >40 years and 66% were married and 52% of subjects were illiterate.

Section B:
Efficay of the respiratory exercises

Table-2: Efficay of the Respiratory Exercises on Respiratory parameter (N=50)

Group	Parameters	Mean		Standard Deviation	Mean Difference	"t"	Statistically Significant
		PRE	POST				
CONTROL	Day 1 - Day 3	2.72	2.6	0.451	0.12	0.05	Non-Significant*
EXPERIMENT		2.52	3.64	1.16	1.12	0.15	Non-Significant**

Statistically Significant (P<0.05)

Table 2 depicts the effect of selected respiratory exercises on the respiratory parameters was determined with the help of 't' test value i.e. calculated value 0.053 was found to be not significant at 0.05 level of significance with the degree of freedom 49 and the mean difference of Day1 to Day3 Pre-test and Post-test was calculated 0.12. Calculated value (found to be lower than the table value, therefore null hypothesis was accepted and the conclusion was drawn that there was no change in the respiratory parameters due to the respiratory exercises.

Similarly on a statistical calculation of't' value 0.15 for the experiment group revealed that there was no significant difference between table value and calculated value therefore null hypothesis was accepted. It can be due to less number sample however it may be established with a large sample size.

Section C

Deals with comparison between experiment and control group

Table-3: Comparison efficacy of respiratory exercises (N=50)

TEST	Parameters	Mean		Standard Deviation		"t"	Statistically Significant
		EXPERIMENT	CONTROL	CONTROL	EXPERIMENT		
PRE	Day 1 - Day 3	2.52	2.72	0.7638	1.479	2.099	Non-Significant*
POST		3.64	2.6	0.7	1.25	4	Significant**

Statistically Significant (P<0.05)

Table 3 predicts pre-test comparisons, calculated 't' test value was 2.099 found to be non-significant at 0.05 level of significance with the degree of freedom 49 and calculated value (lower than the table value) therefore null hypothesis was accepted and the study sample had the same level of knowledge.

On comparisons of post-test for experiment group calculated 't' value was 4 found to be significant at 0.05 level with a degree of freedom 49. As calculated value (higher than the table value) therefore null hypothesis was rejected and the conclusion was respiratory exercises were effective.

Section D:

Deals with association of sociodemography with post-experiment

Table-4: Association of the sociodemographic variable with efect of respiratory exercises (N=50)

Social Demography		Post Experiment		df	Chi-square value
		Count	Expected Count		
Age	<40 years	17	17	5	4.167*
	>40 years	8	8		
Marital	Unmarried	10	10	5	2.361**
	Married	15	15		
Education Status	Illiterate	10	10	10	5.464***
	Matric	14	14		
	Graduation	1	1		

In table 4 establish that the respiratory exercises were solely responsible for the respiratory changes. Association between socio-demographic variables with post-test scores was calculated. There was no association between age group and post-experiment. It was determined with the help of chi-square value that is 4.167 (is lesser than the table value of chi-square i.e. 4.35). It corresponds to the probability of 0.50 in chi-square. It is non-significant and the degree of freedom was five. Hence the conclusion was drawn that age was not associated to bring change in respiratory parameters.

Association between socio-demographic variables with post-test scores was calculated and there was no association between marital status and post-experiment. It was determined with the help of chi-square value that is 2.361 (is lesser than the table value of chi-square i.e. 4.35). It corresponds to the probability of 0.50 in chi-square. It is non-significant and the degree of freedom was five. Hence the conclusion was drawn that marital status was solely not associated with being a change in respiratory parameters in the post-experiment score.

Association between socio-demographic variables with post-test scores were calculated and there was no association between education status and post-experiment. It was determined with the help of the chi-square test. It was determined with the help of chi-square value that is 5.464 (is lesser than the table value of chi-square i.e. 9.34). It corresponds to the probability of 0.50 in chi-square. It is non-significant and the degree of freedom was 10. Hence the conclusion was drawn that education was solely not associated with being the change in respiratory parameters in the post-experiment score.

Section E:

Deals with the effect of selected respiratory exercises on selected respiratory parameters

In table 5 the effect of selected respiratory exercises on the respiratory parameters was calculated with the help of 't' test values and the mean difference of day 1 – day 3 (pre-test and post-test) was calculated therefore it was found to be significant in the experiment group.

Table-5: Effect of selected respiratory exercises on selected respiratory parameters

TEST	Parameters	Mean		Standard Deviation		"t"	Statistically Significant
		EXPERIMENT	CONTROL	CONTROL	EXPERIMENT		
PRE	Day 1 - Day 3	2.52	2.72	0.7638	1.479	2.099	Non-Significant*
POST		3.64	2.6	0.7	1.25	4	Significant**

(N=50)

In the control group, the 't' value was not significant i.e. the values lesser than the table value, therefore the null hypothesis is accepted.

CONCLUSION

Was drawn that respiratory exercises had a positive impact on the selected respiratory parameters in the experiment group which increased the mean difference therefore null hypothesis is rejected as the 't' value is greater than the table value. This study would add the importance of integral role played by nurses in prevention of complications with small efforts and capacity building of the patients.

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