ORIGINAL ARTICLE

© UIJIR | ISSN (O) - 2582-6417
July 2020 | Vol. 1 Issue.2
www.uijir.com

EFFECT OF STEAM INHALATION AND CHEST PHYSIOTHERAPY ON VITAL CAPACITY AMONG PATIENTS WITH COPD

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Abstract *COPD, or chronic obstructive pulmonary disease, is a progressive disease that restricts the lung expansion and makes it hard to breathe. Vital capacity will be decreased or poor in patients with COPD. Steam inhalation and Chest percussion is an effective method for lung clearance and improves vital capacity. The present study was conducted to evaluate the effectiveness of steam inhalation and chest physiotherapy on vital capacity among COPD patients. An evaluative approach with quasi experimental design was used for the study. The study was conducted in District Hospital, Kollam. 60 subjects were selected by purposive sampling, 30 in the experimental group and 30 in the control group. Steam inhalation and chest physiotherapy was given for 20 minutes, thrice daily for five consecutive days. Vital capacity was measured using Spirometry. After intervention the mean post-test value was 52.3 (SD 13.2) and the paired "t" value (10.5,p=0.00) showed that change in vital capacity was significant at 0.01 level in the experimental group. ANCOVA was used to know the improvement of vital capacity in experimental group over control group. It proved that more improvement in vital capacity was seen in the experimental group(F=33.83,P=0.00) that is significant at 0.05 level . The study concluded that Steam inhalation and Chest physiotherapy was effective in improving vital capacity of COPD patients.*

Keywords *Effectiveness, Steam inhalation and Chest physiotherapy, Vital capacity,Chronic Obstructive Pulmonary Disease.*

INTRODUCTION

All body functions are breathing related. Proper oxygen delivery to all parts of our body is crucial to health and well-being. Without oxygen, health begins to suffer and a person dies. Approximately 85 to 90 percent of COPD deaths are caused by smoking. In 2010, almost 24 million adults over the age of 40 in India had COPD. Data monitor expects this number to increase 34% to approximately 32 million by 2020. COPD is predominately a disease of men and only 40% of cases in India occur in women.

Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation. In COPD, there is an increase in airway resistance, which may lead to decreased vital capacity. The most reliable way to determine reversible airway obstruction is with spirometry, a procedure that measuresthe amount of air entering and leaving the lungs.

Steam inhalation is a method of introducing warm, moist air into the lungs via the nose and throat for therapeutic benefit. Dry air passages are moistened, and mucus is loosened or eliminated easier by coughing or blowing the nose. The moist air also alleviates difficulty breathing, throat irritation and inflammation.

NEED AND SIGNIFICANCE OF THE STUDY

Chronic obstructive pulmonary disease (COPD) is the leading cause of death in India and the leading cause of death worldwide. An estimated 64 million people have COPD worldwide in 2004. More than 3 million people died of COPD in 2005, which is equal to 5% of all deaths globally that year. Almost 90% of COPD deaths occur in low- and middle-income countries.

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July 2020 | Vol. 1 Issue.2
www.uijir.com

Total deaths from COPD are projected to increase by more than 30% in the next 10 years without interventions to cut risks, particularly exposure totobacco smoke.

STATEMENT OF THE PROBLEM

"A study to evaluate the effectiveness of steam inhalation and chest physiotherapy on vital capacity among COPD patients at selected Hospital, Kollam".

OBJECTIVES OF THE STUDY

1. To assess the vital capacity of COPD patients before and after steam inhalation and chest physiotherapy among experimental group and control group.
2. To assess the difference in vital capacity before and after providing steam inhalation and chest physiotherapy in the experimental group.
3. To compare the post-test vital capacity between the experimental and control groups.
4. To find out the association between vital capacity among COPD patients and selected demographic variables.

HYPOTHESIS

H_1: There is a significant difference in vital capacity before and after steam inhalationand chest physiotherapy among COPD patients in the experimental group.
H_2: There is a significant difference in the post test vital capacity among COPD
Patients between the experimental and control group.
H_3: There is a significant association between vital capacity and selecteddemographic variables among COPD patients in both the groups.

CONCEPTUAL FRAMEWORK

The conceptual framework used in this study was based on general system model approach. It was developed by Ludwig Von Bertanlanffy (1968) and modified by J.W. Kenny and is called Kenny's open system model.

REVIEW OF LITERATURE

Review of literature in this chapter is divided into the following headings;

1. Literature related to steam inhalation and COPD
2. Literature related to chest physiotherapy and COPD
3. Literature related to vital capacity in COPD
4. Literature related to steam inhalation, chest physiotherapy on vital capacity in COPD

RESEARCH APPROACH

A quantitative evaluative approach was used in the study.

RESEARCH DESIGN

The research design adopted for the study was quasi experimental design.

Group	Pre-Test	Intervention	Post-Test
Experimental	01	X	02
Control	03		04

KEY

O1, O3: Pretest vital capacity of experimental and control group measured using spirometer

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July 2020 | Vol. 1 Issue.2
www.uijir.com

Steam inhalation and chest physiotherapy for 15-20 minutes thrice daily for five consecutive days

O2, O4: Posttest vital capacity of experimental and control group measured using spirometer on the 5th day

SETTING OF THE STUDY

The study was undertaken at Govt. District Hospital, Kollam, Kerala. It is a 650 bedded hospital under Directorate of Health Services. It has got various departments like Department of Medicine, Surgery, Orthopedics, ENT, Ophthalmology, Dentistry, Psychiatry, Dermatology and Psychiatry. About 1500 out patients attend each day in the outpatient department for treatment and 50 to 100 admissions per day. About 25 to 30 COPD patients attend the outpatient department every week. Weekly around 20-25 COPD patients were admitted in the medical wards and ICU.

Target population: In this study the target population was all the people who were diagnosed asCOPD.

Accessible population: In this study the accessible population was people who are diagnosed as COPD and admitted at District hospital, Kollam.

SAMPLE AND SAMPLING TECHNIQUE

60 patients who are diagnosed as COPD, admitted in District hospital, Kollam were selected as the sample of this study. (30 subjects in the experimental group and 30 in the control group.)

TECHNIQUE

Sampling technique used in this study was purposive sampling.

SAMPLING CRITERIA

Inclusion criteria

Patients with COPD who were

- ✓ between the age of 45-65 yrs
- ✓ present at the time of data collection

Exclusion criteria

Patients with COPD who were

- ✓ critically ill
- ✓ mentally challenged
- ✓ not willing to participate in the study

TOOL/ INSTRUMENT

DEVELOPMENT/SELECTION OF TOOL

The tool in this study consisted of

- ✓ Part I :Demographic variables
- ✓ Part II : Clinical variables
- ✓ Part III : Vital capacity measurements using spirometry.

DESCRIPTION OF THE TOOL

Part I: It consisted of a set of 9 items for the demographic variables. Thedemographic variables include age, gender, educational status, occupation, monthly income, domicile, type of family and habits and height in centimeters.

Part II: It consisted of a set of 6 items for the clinical variables that included comorbidities, previous history of respiratory illness, duration of present illness, duration of treatment, type of

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July 2020 | Vol. 1 Issue.2
www.uijir.com

medications and frequency of hospitalization per year. **Part III:** Biophysical: - Spirometer for assessing vital capacity.

SCORE INTERPRETATION

Vital capacity grading

80-100 %	Excellent vital capacity
60–79 %	Good vital capacity
40–59 %	Average vital capacity
Below 40%	Poor vital capacity

Vital capacity grading was done based on Knudson's vital capacity prediction table.

TECHNIQUE

Structured interview was used for collecting demographic and clinical data; vital capacity was measured biophysically using a spirometer.

VALIDITY

Validity of the tool was obtained from 7 experts from the field of medical surgical nursing, medicine and from chest physician. The experts were requested to give their opinions regarding relevance, accuracy, appropriateness of the items for further modifications. Suggestions and recommendations given by the experts were accepted and necessary corrections were made. In part II, clinical variables, initially there was only 5 variables, after experts opinion 'frequency of hospitalization per year' also included in the clinical variables.

RELIABILITY

To assess the reliability of the spirometer, test – retest method was used. Co-relation was computed with Karl Pearson correlation coefficient (r =0.95) and tool was found to be reliable.

PILOT STUDY

A pilot study was conducted at Government Taluk Hospital, Kottarakkara, among 8 patients with COPD. Steam inhalation and chest physiotherapy was effective in improving vital capacity of COPD patients as there was difference in the pre-test(mean=912.5ml, SD=176.33) and post-test (mean=1100ml, SD=472.89) scores.

After pilot study the researcher was not clear regarding the improvement in vital capacity was either due to intervention or due to routine care that patients were receiving. So in order to make it clear the researcher decided to modify the study by including a control group.

DATA COLLECTION PROCESS

The researcher underwent training in chest physiotherapy and obtained certificate from Laurel physiotherapy clinic, Kollam, before conducting the study. Written consent was obtained from each study subjects and the demographic, clinical variables were obtained by using a structuredquestionnaire. Every day morning before steam inhalation and chest physiotherapy and evening after steam inhalation and chest physiotherapy, vital capacity was measured using spirometer for five consecutive days. Approximately 14-18 patients were assessed per day.

PLAN FOR DATA ANALYSIS

- Both descriptive and inferential statistics was used to analyze the data.
- The demographic data of the sample was presented using frequency and percentage.

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July 2020 | Vol. 1 Issue.2
www.uijir.com

- Effectiveness on vital capacity was done by mean & standard deviation, The pre-test and post-test vital capacity was compared by using a paired "t" test and ANCOVA.
- Association of vital capacity with selected demographic variables was tested by using Chi square analysis.

PROTECTION OF HUMAN RIGHTS

- Written informed consent of the subjects was obtained before the study.
- Confidentiality and anonymity of the study subjects were maintained throughout the study.

MAJOR FINDINGS OF THE STUDY

Description of sample characteristics

Majority of the subjects 38.3% belonged to the age group between 56-60 years, majority of the subjects 78.3%were males and 21.7% were females.66.7% had primary education, 50% were unemployed, 75% earned below 3000Rs per month, Majority of the subjects 70% hailed from rural area and 63.3% lived in joint family. Majority of the subjects 56.7% had habits of both smoking and alcoholism, 55% of the subjects had no co morbidities, Majority of the subjects 90% had no previous history of respiratory illness 41.7% of subjects had COPD for duration of more than 4 years, 40% of the subjects were under treatment for more than 4 years, 96.7%of subjects were taking bronchodilators, Majority of the subjects 65% were admitted in the hospital once a year,

- In the pretest, out of 30 subjects, among experimental group, 19 (63%) had poor vital capacity, 10 (33%)) had average vital capacity and 1 (4%) had good vital capacity. In the pretest among the control group, 25 (83%) had poor vittal capacity and 5 (17%) had average vital capacity.
- In the post test among experimental group, 4 (13%) had poor vital capacity, 18 (60%) had average vital capacity and 8 (27%) had good vital capacity. In the post test among the control group, 2 (7%) had poor vital capacity 22 (73%) had average vital capacity and 6 (20%) had good vital capacity.
- The average pre-test and post test score in the experimental group were 38.2 and 52.3 respectively and the average pre and post test score in the control group were 32.8 and 37.5 respectively.
- Mean difference in vital capacity was 14.1 in the experimental group and 4.8 in the control group. The differences in the means of two groups showed that vital capacity was improved in the experimental as compared to the control group.
- The calculated 't' values was 10.5 and 8.46 for the experimental group and the control group respectively and it was statistically significant at 0.05% level and 0.01% level.
- A preliminary analysis of variance (ANOVA) carried out for pretest and posttest taken separately. The average vital capacity score at pretest level is 38.2 and 32.8 respectively for patients in the experimental group and control group. calculated F value (5.10) was greater than the table value for df (1. 58). Vital capacity was significantly greater among patients in experimental group during pretest level.
- The F statistics for the final score (F=24.08) was also greater than table value for df (1. 58). It means that the average vital capacity score of experimental (52.3.) group is significantly greater than that of control group (37.5) at posttest level. Hence the intervention in experimental group was statistically found to be effective than the control group who were receiving conventional treatment for improving the vital capacity.

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July 2020 | Vol. 1 Issue.2
www.uijir.com

- There was a significant association between gender (6.27, p=0.012) habits (6.82, p=0.009) type of drug (bronchodilators), (5.69, p=0.017) and vital capacity.
- There was no significant association between age (1.67, p=.434) educational status (4.22, p=0.121) occupation (0.0, p=1) monthly income (0.0, p=1) domicile (0.26, p=0.610) type of family (1.67, p=0.196) co morbidities (0.01, p=0.907) duration of illness (0.27, p=0.873) duration of treatment (0.06, p=0.971) frequency of hospitalization per year (0.13, p=0.713) and vital capacity.
- The above study findings were congruent with a study conducted by Bolukbas S, to determine the effect of steam inhalation in conjunction with smoking cessation and chest physiotherapy. The study results showed improvement in Forced expiratory volume in 1 second and also improved the severity of COPD.
- The first and the second Hypothesis was accepted and the third Hypothesis was rejected.

CONCLUSION

Steam inhalation and chest physiotherapy was effective in loosening thick secretions. The intervention also helped in sputum expectoration and there by improved lung clearance and vital capacity in patients with COPD. There was a significant association between gender, habits, type of drug taken and vital capacity.

NURSING IMPLICATIONS

Nursing Practice

- Nurses working in the hospital as well as in the community should be equipped with skill and knowledge to take care of the COPD patients, patient's family members and patients should be given adequate information regarding the COPD and benefits of steam inhalation and chest physiotherapy.
- The nurse could educate the patients regarding the importance of smoking cessation, adequate nutrition, and prevention of exacerbation symptoms and about pulmonary rehabilitation.

Nursing Education

- The health care delivery system at present gives more emphasis on preventive rather than curative aspects, even though the people come to the hospital after getting the disease.
- Every nurse and student nurse should be encouraged in teaching the patients regarding measures to be performed to prevent COPD and its exacerbation.
- Nursing students should be trained to acquire the skill and knowledge in assessing the learning needs of the patients with COPD and to plan out teaching programs based on the same in the hospital and in the community setting.

Nursing Administration

- Nurse administrators can conduct in-service education programs regarding importance of easily available techniques to the patients and their relatives during their stay in the hospital.
- Nurse administrators should take an initiative in creating policies or plans in providing education to the patients during their hospital stay and involve the patients in their promotion of health. They should plan for manpower, money material, methods and time to conduct successful patient education program.

Nursing Research

- Emphasis on research and clinical studies is needed to improve the quality of nursing care. The present study is only an initial investigation in the area of treating the patients

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July 2020 | Vol. 1 Issue.2
www.uijir.com

with COPD, on alleviation of symptoms.

- There is a need for extended and intensive research in the areas, especially cessation of smoking, management of allergies, exercise therapy, spiritual, economic aspects and thereby to promote a holistic healing of patients with COPD.

LIMITATIONS

1. The sample size was relatively small and hence generalization can be done with caution.
2. Sample subjects were selected only from one hospital in Kollam District; hence generalization can only be made for the sample studied.

RECOMMENDATIONS

- A similar study can be undertaken with a larger sample size, longer duration of time and in different settings to generalize the findings.
- A longitudinal study can be done with various intervals at 6 months,1 year etc to evaluate the extent of the effect of intervention.
- A similar study can be done with other agents like saline, hypertonic saline, terbutalineetc for steam inhalation.

Table 1: Distribution of subjects according to vital capacityn = 60

		Poor		Average		Good		Excellent	
		f	%	f	%	f	%	f	%
Experimental	Pre-Test	19	63	10	33	1	4	0	0
	Post-Test	4	13	18	60	8	27	0	0
Control	Pre-Test	25	83	5	17	0	0	0	0
	Post-Test	2	7	22	73	6	20	0	0

Table 2: Effectiveness of steam inhalation and chest physiotherapy on vital capacity

Group	Stage	Mean	SD	N	Mean Difference	Paired t	P
Experimental	Pre test	38.2	9.5	30	14.1	10.5	00
	Post test	52.3	13.2	30	-		
Contol	Pre test	32.8	9.1	30	4.8	8.46	00
	Post test	37.5	9.8	30	-		

Table 3: Comparison of vital capacity by ANCOVA

Stage	Group	Mean±SD	df	F	P
Pre	Experimental	38.2 ± 9.5	1.58	5.10	0.028
	Control	32.8 ± 9.1			
Post	Experimental	52.3 ± 13.2	1.58	24.08	00
	Control	37.5 ± 1			
Adjusted Pre Existing difference	Experimental	49.3 ± 1	1.57	33.83	00
	Control	40.5 ± 1			

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