

A Study to Assess the Effectiveness of Oscillatory Positive Expiratory Pressure Therapy on Clinical Outcomes Among COPD Patients Admitted in Selected Tertiary Care Hospitals of Western Maharashtra

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ABSTRACT

Introduction: COPD is the third leading cause of death worldwide according to WHO. COPD once known as smokers cough, is now understood because of genetic and environmental interactions. Gene mutation causing antitrypsin deficiency & tobacco consumption are the major risk factors. Chronic small airway dysfunction and episodes of acute exacerbation with severe airflow obstruction, dyspnea, sputum production, impaired gas exchange and hypoxemia are salient features of COPD. Pharmacological and non-pharmacological approaches are employed for airway clearance. OPEP therapy is a airway clearance technique.

Materials and methods: The aim of the study is to assess the effectiveness of OPEP therapy on clinical outcomes among COPD patients. A pre-experimental one group pre-test post-test design was conducted to assess the effectiveness of OPEP therapy on clinical outcomes among COPD patients admitted to selected tertiary care hospitals. After ethical committee clearance, 33 subjects were selected conveniently. Validity and reliability of the tool was established and baseline data was collected. OPEP therapy was administered in two sessions twice a day, each session containing 5 breaths each, followed by 2 huff cough. Data related to clinical variables and self-reported symptoms were collected on each day.

Results: Study reveals that there is a statistically significant difference between the pre- and post-interventional respiratory rate ($p < 0.0001$) heart rate ($p < 0.0001$), SpO₂ ($p = 0.002$) PEFR ($p = 0.03$). This study also reveals that there is a significant difference in pre and post interventional self-reported symptom score (CCQ, $p < 0.0001$)

Conclusion: OPEP therapy proved to be effective, in producing positive clinical outcomes and can be used effectively to manage symptoms among COPD patients.

Keywords: COPD, OPEP therapy, PEFR, Clinical Outcomes, CCQ

INTRODUCTION

Prana (breath) is cardinal to life. Ancient Indians regarded breathing with greater importance. ⁽¹⁾ Any trouble in breathing is

associated with worry, apprehension and fear of death. With the increasing levels of air pollution, lungs are constantly exposed to toxic particles, dust other than active and

passive smoking. COPD is the most common disease with which patient's get hospitalized. WHO (2019) report shows that COPD is the third leading cause of death. ⁽²⁾ A lancet article published in TOI (2023) is titled as India could face third highest economic burden of COPD from 2020-2050. ⁽³⁾

India is the second largest tobacco consuming country & COPD is the common respiratory disease with seasonal variations. ⁽⁴⁾ Though pharmacological treatment is the mainstay of management, non-pharmacological methods like dyspnea relieving strategies, strength training, airway clearance techniques will improve the quality of life and decrease hospital length of stay. ⁽⁵⁾

Need

COPD affects 4% of world's population. ⁽⁶⁾ Study conducted by Verma et al concludes that there is a need for multi-centric national level research study and health literacy programme for prevention of COPD. ⁽⁷⁾

Dr Sehla V in EH News bureau pulmonary rehabilitation programme in India- need of the hour. ⁽⁸⁾ A RCT conducted by Xu Z, Han Z, Ma D on efficacy and safety of long term use of PEP device in COPD patients. They included 25 pre COPD and COPD subjects. The results prove PEP device is safe and effective for daily use as part of pulmonary rehabilitation programme. ⁽⁹⁾

PROBLEM STATEMENT

A study to assess the effectiveness of Oscillatory Positive Expiratory pressure (OPEP) therapy on clinical outcomes among COPD patients admitted in selected tertiary care hospitals of Western Maharashtra.

AIM OF THE STUDY

Assess the effectiveness of Oscillatory Positive Expiratory pressure (OPEP) therapy on clinical outcomes among COPD patients admitted in selected tertiary care hospitals of Western Maharashtra.

OBJECTIVES OF THE STUDY

Primary objectives

1. Compare the pre and post interventional mean scores of respiratory rate, SpO₂ and peak expiratory flow rate of Chronic Obstructive Pulmonary Disease patients.
2. Compare the pre and post interventional mean scores of self-reported symptoms of Chronic Obstructive Pulmonary Disease patients.

Secondary objectives

1. Associate the baseline respiratory rate, SpO₂ and peak expiratory flow rate with selected demographic variables of Chronic Obstructive Pulmonary Disease patients.
2. Associate the baseline self-reported symptoms with selected demographic variables of Chronic Obstructive Pulmonary Disease patients.

MATERIALS & METHODS

Study design: Pre-experimental one group pre-test post-test design

Setting of the study – tertiary care hospitals of western Maharashtra

Sample size-33

Sampling technique- purposive sampling

Tool- The questionnaire was prepared in three parts containing demographic variables, clinical variables and the CCQ. The validity and reliability of the tool was ensured

IEC clearance was obtained

Inclusion Criteria

1. Patients with Chronic Obstructive Pulmonary Disease
2. Patients who are available during the data collection phase
3. Chronic Obstructive Pulmonary Disease patients who are hemodynamically stable
4. Patients who are able to follow the instructions.

Exclusion Criteria

1. Patients who have undergone recent surgery (cranial, abdominal, facial, oral and ear)
2. Patients having raised intracranial pressure
3. Patients who had recent myocardial infarction.
4. Patient on home NIV therapy
5. Patient having facial and oral injuries
6. Patient having neuromuscular weakness
7. Patients having middle ear pathology

PROCEDURE

The pre-test data was collected form each subject on demographic variables, clinical variables were measured and CCQ was

administered. Each subject was administered Oscillatory PEP therapy in sessions twice a day with each session containing 5 breaths through the device followed by 2 huff cough. The post-test data on clinical variables were measured and the CCQ was administered from day 2 to day 5 of the therapy. The data was collected and excel sheet was prepared.

STATISTICAL ANALYSIS

Both descriptive and inferential statistics were used for the analysis of data on SPSS.

RESULT

Both descriptive and inferential statistics were used for the analysis of data on SPSS.

Table 1: Distribution of subjects as per demographic data

S. No	Demographic Variable	Category	No	%
1.	Age (yrs)	50-60	7	21.2
		61 – 70	20	60.6
		71& above	6	18.2
2.	Gender	Male	19	57.6
		Female	14	42.4
3.	Education	Illiterate	6	18.2
		Primary	12	36.4
		Secondary	12	36.4
		Graduate	3	9.1
4.	Occupation	Unemployed	18	54.5
		Private	2	6.1
		Government	7	21.2
		Self employed	6	18.2
5.	Area of residence	Urban	29	87.9
		Semi urban	2	6.1
		Rural	2	6.1
6.	Smoking Habit If yes,	No	19	57.6
		Previous	14	100
		Current	0	0
7.	Biomass fuel exposure	Yes	2	6.1
		No	31	93.9
8.	BMI	<20	3	9.1
		20 – 25	7	21.2
		26 – 30	20	60.6
		31 & above	3	9.1
9.	Duration of illness	1yr 1m - 2 yrs	5	15.2
		2yrs 1m -3 yrs	9	27.3
		3yrs 1m- 4 yrs	10	30.3
		≥ 4 yrs	9	27.3
10.	H/O exacerbation	Once	14	42.4
		Twice	11	33.3
		Thrice	6	18.2
		≥4	2	6.1
11.	Seasonal variation	Yes	33	100

Majority of the subjects belonged to 61-70 years age group. Out of 33 subjects 19 were male and 14 were female. 29 subjects belonged to urban area and 2 subjects

belonged to semi-urban and rural area. 19 subjects denied of smoking habits, whereas 14 subjects were reformed smokers.

Table 2: Comparison of pre-interventional & post- interventional respiratory rate, heart rate, spo2 and PEFR n=33

Parameter	Pre-intervention		Post-intervention		t Value	p Value
	Mean	SD	Mean	SD		
RR (min)	26.67	2.72	21.45	2.25	9.71	<0.0001
HR(Min)	104.6	9.77	89.82	7.70	8.32	<0.0001
SpO2	92.67	3.33	94.73	2.16	3.34	0.002
PEFR	192.3	44.67	198.5	41.24	2.16	0.039

Df=32 Table Value=2.03

The pre-interventional and post interventional Respiratory rate, Heart rate, SpO2 and PEFR was compared with statistical t test, the t values are higher than

the table value at $p < 0.05$. hence there is statistically significant difference between pre and post interventional Respiratory rate, Heart rate, SpO2 and PEFR.

Table 3: Comparison of pre and post interventional self-reported symptoms score (CCQ) n=33

Parameter	Pre-intervention			Post-intervention			Wilcoxon Z Value	p Value
	Mean	SD	Me (IQR)	Mean	SD	Me (IQR)		
CCQ score	3.79	0.66	3.7 (3.3-4.4)	2.09	0.92	1.9 (1.5-2.8)	4.86	<0.0001

Table value= 1.96

Table 3 interprets the comparison of pre and post-interventional score of CCQ score among COPD patients in study group. The pre- interventional mean self-reported symptom (CCQ) score is 3.79 ± 0.66 , whereas the post-interventional mean self-

reported symptom (CCQ) score is 2.09 ± 0.92 . When extrapolated statistically it was found that there is a significant difference between pre and post interventional mean self-reported symptom (CCQ) score as the P valve is < 0.05 .

Table 4: Association of pre- interventional mean respiratory rate & gender n =33

Category		n	Pre-interventional respiratory rate (min)		t Value	p Value
			Mean	SD		
Gender	Male	19	25.68	2.77	2.63	0.013
	Female	14	28.00	2.07		
Smoking	Yes	14	25.57	3.15	2.08	0.045
	No	19	27.47	2.09		

(Df =31, table value=2.04)

Table 4 represents the association of pre-test respiratory rate and gender in study group. The mean respiratory rate in male was 25.68 ± 2.77 and in female was 28 ± 2.07 . When

extrapolated statistically there is a significant association between the mean respiratory rate and gender of the subjects.

Figure 1: Association of pre- interventional mean heart rate & smoking habits

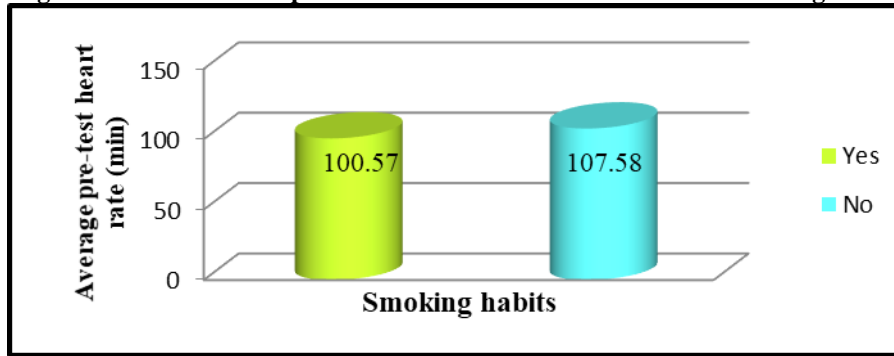


Figure 1 outlines the association of pre-test mean heart rate according to smoking habits in study group. The mean pre-test heart rate in subjects with smoking habits is 100.57 ± 7.82 and in subjects, not having smoking

habit is 107.58 ± 10.16 . When extrapolated statistically it was found that there is a significant association between smoking habit and mean heart rate as the P value is < 0.05 .

Figure 2: Association of pre- interventional mean SpO2 and smoking habits



Figure 2 shows the association of pre-intervention SpO2 according to smoking habits in study group. The mean pre-interventional SpO2 in subjects with smoking habits was 93.29 ± 2.84 and in

subjects, not having smoking habit is 92.21 ± 3.66 . Statistical analysis revealed that there is no association between smoking habit and SpO2 as the P value is > 0.05 .

Table 5: Association of pre interventional mean self-reported symptom (CCQ) score and smoking habits n=33

Smoking habits	Pre-test CCQ score			MW test Z Value	P Value
	n	Mean	SD		
Yes	14	3.89	0.67	0.69	0.49
No	19	3.72	0.65		

Table value- 1.96

Table 5 depicts association of pre-interventional self-reported symptom (CCQ) score according to smoking habits in study group. The pre-interventional mean self-reported symptom (CCQ) score in subjects having smoking habits was 3.89 ± 0.67 and subjects not having smoking habits was 3.72 ± 0.65 . When extrapolated statistically it was found that there is a significant association between the pre-

interventional self-reported symptom (CCQ) score and the smoking habit of subjects as the P value is < 0.05 .

DISCUSSION

This study results conclude that is a difference between pre and post-interventional Respiratory rate, SpO2, PEFR. This is supported by the pre experimental study conducted by Dr Ansari H, Dhake S,

Ahmed S on positive expiratory pressure therapy on patients with pleural disease shows that there is a significant difference in SpO₂ levels of PEP group. ⁽¹⁰⁾ This is also supported by study conducted by Trivedi KS, Joshi MR on autogenic drainage vs flutter device on PEFR value & SpO₂ as the pre-interventional mean PEFR was 176.36 ± 35.12 and after oscillatory positive expiratory pressure therapy is 212.72 ± 42.22 ($p=0.00$). ⁽¹¹⁾

The present study results shows that there is a significant difference between pre and post interventional self reported symptom score (CCQ). This is supported by Zampogna E, Crisafuli E, Andria MD, Cristina G, Bellelli G, Lucini E et al conducted a exploratory study to compare expiratory flow accelerator technique and positive expiratory pressure technique, The CCQ score in positive expiratory pressure group at baseline was 2.9 ± 1.1 and post intervention the score was 1.7 ± 0.6 ($p=0.001$). ⁽¹²⁾

CONCLUSION

Oscillatory positive expiratory pressure therapy shows better clinical outcomes and reduction in symptom severity among COPD patients and can be used as an effective and safe non-pharmacological intervention for airway clearance.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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