

Effectiveness of a Structured Educational Intervention on Knowledge and Practice Regarding Breathing Exercises Among Patients with Chronic Obstructive Pulmonary Disease in Selected Hospitals of Dehradun: A Quasi-Experimental Study

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder and a major contributor to morbidity and mortality worldwide. Although breathing exercises such as pursed-lip breathing and diaphragmatic breathing are recommended as essential components of pulmonary rehabilitation, many patients have inadequate knowledge and poor practice of these techniques. Structured educational interventions delivered by nurses may improve patient self-management and functional outcomes.

Aim: To evaluate the effectiveness of a structured educational intervention on knowledge and practice regarding breathing exercises among COPD patients in selected hospitals of Dehradun.

Methods: A quantitative quasi-experimental study with experimental and control groups was conducted among 60 clinically diagnosed COPD patients (30 experimental and 30 control). Participants were selected through purposive sampling. Baseline knowledge and practice were assessed using a structured knowledge questionnaire and an observational practice checklist. The experimental group received a structured educational intervention consisting of explanation, demonstration, and supervised practice of pursed-lip and diaphragmatic breathing techniques, while the control group received routine care. Post-test assessment was conducted after the intervention. Data were analyzed using descriptive and inferential statistics including paired t-tests, independent t-tests, and chi-square tests.

Results: Baseline knowledge and practice scores were low and comparable in both groups. In the experimental group, the mean knowledge score increased from 10.50 ± 3.12 to 21.03 ± 2.84 ($p < 0.001$), while the mean practice score improved from 4.93 ± 1.46 to 7.57 ± 1.28 ($p < 0.05$). No statistically significant improvement was observed in the control group. Post-test comparison showed significantly higher knowledge and practice scores in the experimental group compared with the control group. Most demographic variables were not significantly associated with post-test outcomes.

Conclusion: The structured educational intervention significantly improved both knowledge and practice of breathing exercises among COPD patients. Integrating nurse-led structured teaching programmes into routine COPD care may enhance patient self-management and pulmonary rehabilitation outcomes.

KEYWORDS: Chronic Obstructive Pulmonary Disease, Breathing Exercises, Pulmonary Rehabilitation, Patient Education, Nursing Intervention, Knowledge, Practice.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a chronic, progressive respiratory disorder characterized by persistent airflow limitation and respiratory symptoms such as dyspnea, chronic

cough, sputum production, and reduced exercise tolerance. The disease results from chronic inflammation of the airways and lung parenchyma and is commonly associated with exposure to tobacco

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smoke, biomass fuel, occupational dust, and environmental pollutants. COPD is currently one of the leading causes of disability and premature mortality worldwide, and its burden continues to increase because of population ageing, urbanization, and continued exposure to respiratory irritants.

The World Health Organization has identified COPD as a major non-communicable disease responsible for millions of deaths annually. India contributes substantially to the global COPD burden because of widespread tobacco use, indoor biomass fuel exposure, and outdoor air pollution. The disease imposes considerable economic, social, and psychological burdens on individuals, families, and healthcare systems through recurrent exacerbations, frequent hospitalizations, reduced productivity, and impaired quality of life.

Pulmonary rehabilitation is a cornerstone of comprehensive COPD management. It includes exercise training, breathing exercises, patient education, nutritional advice, and psychosocial support. Among these components, **pursed-lip breathing** and **diaphragmatic breathing** are simple, inexpensive, and effective techniques that improve ventilation efficiency, reduce dynamic hyperinflation, decrease the work of breathing, and alleviate dyspnea. These exercises can be taught easily by nurses and practiced independently by patients at home.

Despite strong international recommendations, breathing exercises remain underutilized in many healthcare settings in India. Patients often receive pharmacological treatment without adequate education regarding breathing techniques and self-management strategies. Limited awareness, insufficient demonstration, and poor adherence contribute to suboptimal pulmonary rehabilitation outcomes.

Nurses are uniquely positioned to bridge this gap through structured educational interventions. Nurse-led teaching programmes can improve patient understanding, reinforce correct breathing techniques, promote adherence, and empower individuals to participate actively in disease management. Evidence suggests that educational interventions can enhance knowledge, self-efficacy, exercise tolerance, and quality of life among COPD patients. However, region-specific evidence from Uttarakhand remains limited.

The present study was undertaken to evaluate the effectiveness of a structured educational intervention on the knowledge and practice of breathing exercises among COPD patients attending selected hospitals in Dehradun. Generating local evidence may support the

integration of structured breathing exercise education into routine nursing care and pulmonary rehabilitation services.

OBJECTIVES: -

1. To assess the pre-intervention knowledge of COPD patients regarding breathing exercises in Experimental and Control group
2. To assess the pre-intervention practice of breathing exercises among COPD patients in Experimental and Control group
3. To evaluate the effectiveness on knowledge and practice after administering the structured educational programme.
4. To compare the pre- and post-intervention knowledge and practice scores.
5. To find the association between post-intervention knowledge and practice scores with selected demographic variables.

HYPOTHESES

H1 (Research Hypotheses)

- There will be no significant difference between pre- and post-intervention knowledge and practice scores regarding breathing exercises.
- There will be a significant increase in the post-intervention knowledge and Practice scores regarding breathing exercises among COPD patients compared to pre-intervention scores.
- There will be a significant association between pre-intervention knowledge and practice with selected demographic variables.

Materials and Methods

Study Design: A **quantitative quasi-experimental research design** with experimental and control groups was adopted to evaluate the effectiveness of the structured educational intervention.

Setting and Participants: The study was conducted in selected hospitals of Dehradun, Uttarakhand. A total of **60 clinically diagnosed COPD patients** were included, with **30 participants in the experimental group** and **30 participants in the control group**.

Inclusion Criteria

Participants were eligible if they:

- had a confirmed diagnosis of COPD,
- were aged **40 years or above**,
- were able to communicate in Hindi or English,
- were clinically stable during data collection, and
- were willing to participate and provide informed consent.

Patients with severe cardiac disease, neurological disorders, or other conditions preventing performance of breathing exercises were excluded.

Sampling Technique: Participants were selected using **non-probability purposive sampling** and allocated into experimental and control groups according to study feasibility and hospital availability.

Research Instruments: Data were collected using two researcher-developed tools.

Structured Knowledge Questionnaire: The questionnaire assessed participants' knowledge regarding:

- COPD and pulmonary rehabilitation,
- purpose of breathing exercises,
- benefits of diaphragmatic and pursed-lip breathing,
- procedure and frequency of breathing exercises,
- precautions during practice.

Correct responses were scored and converted into knowledge levels.

Observational Practice Checklist: A standardized checklist was used to assess the performance of:

- diaphragmatic breathing, and
- pursed-lip breathing.

The checklist evaluated body position, breathing coordination, inspiration and expiration technique, pacing, and overall execution.

Validity and Reliability

The instruments were validated by experts in Medical-Surgical Nursing, Pulmonary Medicine, and Nursing Education. Reliability testing demonstrated acceptable internal consistency and observational reliability prior to the main study.

Intervention: The **structured educational intervention** was administered only to the experimental group and included:

- explanation of COPD and breathing exercises,
- demonstration of diaphragmatic breathing,
- demonstration of pursed-lip breathing,
- supervised return demonstration by participants,
- correction of technique,
- reinforcement of daily home practice.

The teaching session lasted approximately **45–60 minutes** and was delivered individually or in small groups by the researcher.

The control group continued to receive routine hospital care without structured breathing exercise education.

Data Collection Procedure

Baseline assessment of knowledge and practice was conducted in both groups. After the pre-test, the experimental group received the structured educational intervention. Post-test assessment was performed after the predetermined follow-up period using the same instruments.

Ethical Considerations

Ethical approval was obtained from the institutional ethics committee. Administrative permission was secured from participating hospitals. Written informed consent was obtained from all participants, and confidentiality and anonymity were maintained throughout the study.

Statistical Analysis

Data were analyzed using SPSS software. Descriptive statistics (frequency, percentage, mean, and standard deviation) summarized demographic characteristics and outcome scores. Inferential statistics included paired t-tests, independent t-tests, and chi-square tests. Statistical significance was considered at $p < 0.05$.

Results

Demographic Characteristics: Among the 60 participants, most were aged **50 years or above**, and males constituted the majority of the sample. A substantial proportion had primary or secondary education, and many participants reported previous tobacco use or exposure to biomass fuel. The experimental and control groups were comparable with respect to age, gender, education, occupation, residence, addiction history, and duration of COPD.

Table 1: Frequency and Percentage Distribution of Participants According to Demographic Variables (n = 60)

Demographic Variables	Categories	Experimental		Control	
		f	%	f	%
Age (years)	30–39	12	40.0	12	40.0
	40–49	9	30.0	7	23.0
	50–59	6	20.0	7	23.0
	60–69	3	10.0	4	13.0
Gender	Male	25	83.0	23	77.0
	Female	5	17.0	7	23.0

Education	No formal education	0	0.0	0	0.0
	Primary	7	23.0	5	17.0
	Secondary	9	30.0	9	30.0
	Higher Secondary	6	20.0	6	20.0
	Graduate +	8	27.0	10	33.0
Occupation	Employed	9	30.0	9	30.0
	Unemployed	7	23.0	6	20.0
	Retired	6	20.0	8	27.0
	Homemaker	8	27.0	7	23.0
Area of Residence	Urban	20	67.0	16	53.
	Rural	10	33.0	14	47.0
Addiction Habits	Smocking	12	40.0	11	37.0
	Alcohols	8	27.0	7	23.0
	Both	6	20.0	6	20.0
	None	4	13.0	5	17.0
Duration of COPD Diagnosis (years)	<1 year	9	30.0	9	30.0
	1–4 years	10	33.0	10	33.0
	5–9 years	9	30.0	8	27.0
	≥10 years	2	7.0	3	10.0

Knowledge Scores: At baseline, knowledge regarding breathing exercises was low in both groups.

The **experimental group** demonstrated a marked improvement following the intervention:

- **Pre-test mean:** 10.50 ± 3.12
- **Post-test mean:** 21.03 ± 2.84

The increase was statistically highly significant ($p < 0.001$).

In contrast, the control group showed only minimal, non-significant change in knowledge scores.

Table 2: Pre-test and post Knowledge Levels of Experimental Groups

Knowledge Level	Score Range	Pre-Test f (%)	Post-Test f (%)
Inadequate	0–10	18 (60.0)	0 (0.0)
Moderately Adequate	11–20	11 (36.7)	11 (36.7)
Adequate	21–30	1 (3.3)	19 (63.3)

Practice Scores: Practice of breathing exercises was inadequate in both groups during pre-test assessment.

The **experimental group** showed significant improvement after receiving the structured educational intervention:

- **Pre-test mean:** 4.93 ± 1.46
- **Post-test mean:** 7.57 ± 1.28

This improvement was statistically significant ($p < 0.05$).

The control group demonstrated no meaningful improvement in practice performance.

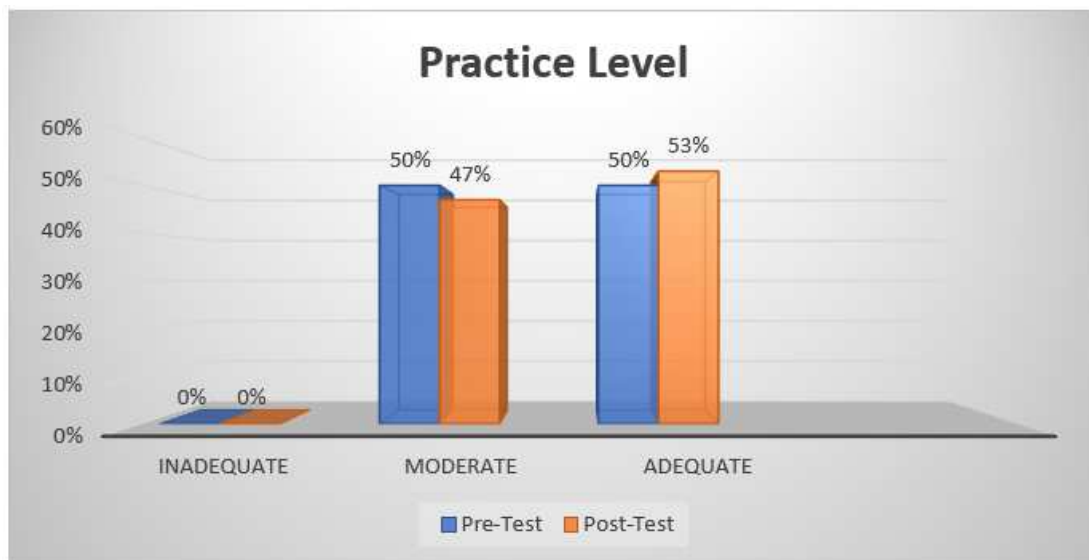


Fig 1: Pre-test and post Practice Levels of Experimental Groups

Comparison Between Experimental and Control Groups

Post-test comparison revealed that the experimental group achieved significantly higher knowledge and practice scores than the control group, confirming the effectiveness of the structured educational intervention.

Table 3: Comparison of Pre-test and Post-test Knowledge Scores in Experimental Group

Test	Mean	SD	t-value	p-value
Pre-test	10.5	3.76	8.890	.00001*
Post-test	21.03	2.53		

Table 4: Comparison of Pre-test and Post-test Practice Scores in Experimental Group

Test	Mean	SD	t-value	p-value
Pre-test	4.93	1.74	2.127	.0188*
Post-test	7.57	1.33		

Association with Demographic Variables

Chi-square analysis indicated that most demographic variables, including age, gender, education, occupation, residence, and duration of illness, were not significantly associated with post-test knowledge and practice scores. A limited association was observed between addiction habits and practice performance.

Discussion

The present study demonstrated that a structured educational intervention significantly improved both knowledge and practice of breathing exercises among COPD patients. The findings support the hypothesis that organized, nurse-led educational programmes can enhance patient understanding and performance of pulmonary rehabilitation techniques.

The substantial improvement in knowledge scores indicates that participants responded positively to the combination of explanation, demonstration, and reinforcement. Prior to the intervention, many participants lacked understanding of the purpose, benefits, and correct technique of diaphragmatic and pursed-lip breathing. Following structured teaching, participants showed a marked increase in knowledge, suggesting that educational deficits can be effectively addressed through systematic instruction.

Improvement in practice scores further confirms the value of demonstration-based teaching. Breathing

exercises require psychomotor learning, and supervised return demonstration allows correction of common errors such as shallow breathing, rapid expiration, poor lip positioning, and inadequate diaphragmatic movement. The observed improvement suggests that participants acquired practical skills that may contribute to better symptom management.

These findings are consistent with previous studies reporting significant improvements in exercise tolerance, dyspnea control, and self-management following pulmonary rehabilitation and breathing exercise training. Research on diaphragmatic breathing, pursed-lip breathing, and nurse-led pulmonary rehabilitation programmes has repeatedly demonstrated improvements in functional capacity and patient confidence. Digital and tele-rehabilitation studies have also shown that structured instruction enhances adherence and outcomes.

The absence of significant associations between most demographic variables and post-test outcomes

suggests that structured educational interventions may be beneficial across diverse COPD populations regardless of age, gender, educational level, or occupation. This supports the feasibility of implementing standardized breathing exercise education as part of routine nursing care.

From a nursing perspective, the intervention is particularly relevant because it is **low-cost, non-invasive, easy to administer, and suitable for hospital and community settings**. Nurses can incorporate breathing exercise teaching into routine patient education during hospitalization, outpatient visits, pulmonary rehabilitation sessions, and discharge planning.

Improved knowledge and practice may contribute to better symptom control, reduced dyspnea, enhanced exercise tolerance, increased independence, and potentially fewer exacerbations and hospital admissions. Although the present study did not directly measure pulmonary function or quality of life, improved breathing technique is likely to support broader rehabilitation outcomes.

Nursing Implications

The findings have important implications for nursing education, clinical practice, administration, and research.

Nursing Practice

- Routine assessment of breathing exercise knowledge should be incorporated into COPD care.
- Nurses should provide individualized demonstration and supervised practice of diaphragmatic and pursed-lip breathing.
- Breathing exercise education should be included in discharge planning and follow-up care.

Nursing Education

- Pulmonary rehabilitation and breathing exercise training should receive greater emphasis in undergraduate and postgraduate nursing curricula.
- Simulation-based teaching may improve nursing competence in demonstrating breathing techniques.

Nursing Administration

- Hospitals should develop standardized educational protocols and patient teaching materials for COPD management.
- Dedicated pulmonary rehabilitation education sessions may improve patient outcomes and reduce readmissions.

Nursing Research

- Future studies should evaluate long-term adherence to breathing exercises.
- Multicenter randomized controlled trials with larger samples are needed.
- Research should assess effects on pulmonary function, quality of life, anxiety, exercise capacity, and healthcare utilization.

Limitations

Several limitations should be considered.

- The sample size was relatively small (**n = 60**).
- Participants were selected using purposive sampling.
- The study was confined to selected hospitals in Dehradun.
- Follow-up duration was limited.
- Objective pulmonary function outcomes were not assessed.

Despite these limitations, the study provides valuable evidence regarding the effectiveness of structured educational interventions for COPD patients in a regional Indian healthcare setting.

Conclusion

The present quasi-experimental study demonstrated that a **structured educational intervention significantly improved knowledge and practice regarding breathing exercises among COPD patients** in selected hospitals of Dehradun. Participants who received nurse-led education and demonstration of diaphragmatic and pursed-lip breathing achieved substantially higher post-test scores than those receiving routine care.

Breathing exercises represent a simple, inexpensive, and evidence-based component of pulmonary rehabilitation that can be taught effectively by nurses. Incorporating structured educational programmes into routine COPD management may strengthen patient self-management, improve symptom control, and enhance rehabilitation outcomes.

The findings support the integration of standardized breathing exercise education into hospital and community COPD services and reinforce the essential role of nurses in pulmonary rehabilitation and chronic disease management.

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