Effectiveness of Respiratory Guidance on Respiratory Status and Health Related Quality of Life among Patients with Chronic Obstructive Pulmonary Disease in Selected Private Hospitals, Coimbatore: A Pilot Study

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder that causes dyspnea, reduced lung capacity, and poor health-related quality of life (HRQOL). A pilot study was conducted to evaluate the effectiveness of a structured respiratory guidance programme on respiratory status and HRQOL among patients with COPD in selected private hospitals at Coimbatore.

A total of 30 patients with Stage I and Stage II COPD were selected by purposive sampling and assigned to experimental and control groups, with 15 participants in each group. The experimental group received a structured respiratory guidance programme consisting of airway clearance, pursed-lip breathing, diaphragmatic breathing, incentive spirometry training, breathing exercise-based movement training, and balloon-blowing exercises, while the control group received routine care and standard incentive spirometry. Dyspnea severity, lung capacity, and HRQOL were assessed before and after the intervention using the Modified Borg Dyspnea Scale, incentive spirometry performance, and the St. George's Respiratory Questionnaire–COPD version.

The findings showed that both groups were comparable at baseline, with no significant differences in demographic or outcome variables. After the intervention, the experimental group demonstrated a significant reduction in dyspnea, improvement in lung capacity, and better HRQOL compared with the control group. Within-group analysis also showed significant improvement in all three outcome measures in the experimental group, while the control group showed no meaningful change. Correlation analysis revealed a moderate positive relationship between improvement in respiratory status and HRQOL in the experimental group.

The pilot study concludes that respiratory guidance is an effective non-pharmacological nursing intervention for improving dyspnea, lung capacity, and HRQOL in patients with COPD. The findings support the inclusion of structured respiratory guidance in routine nursing care and pulmonary rehabilitation programmes.

Keywords: COPD, respiratory guidance, dyspnea, lung capacity, quality of life, nursing intervention.

INTRODUCTION

Breathing is the most fundamental of all physiological processes, sustaining life through a delicate interplay of respiratory musculature and neurochemical control. Under normal circumstances, an adult performs approximately 17,000–23,000 respiratory cycles per day, with each cycle involving a brief inspiratory phase of one to one-and-a-half seconds followed by a slightly longer expiratory phase. When this process is compromised by chronic disease, even routine daily activities become physically demanding.

Chronic obstructive pulmonary disease (COPD) is a progressive, preventable respiratory disorder characterized by persistent airflow limitation and chronic airway inflammation. It manifests clinically as dyspnea, chronic productive cough, wheezing, and exercise intolerance. As the disease advances, structural changes in the lung parenchyma—including hyperinflation and diaphragmatic flattening—impair the mechanical efficiency of respiratory muscles, accelerating symptom burden and functional decline. COPD ranks third among leading causes of global mortality, accounting for approximately 3.3 million deaths annually and representing 5% of all deaths worldwide.

Epidemiologically, the burden of COPD is disproportionately concentrated in low- and middle-income countries, which contribute nearly 90% of COPD-related mortality. In India, the condition affects between 50 and 55 million individuals, with an overall adult prevalence of approximately 7.4%[15]. Indigenous risk factors—including widespread use of biomass fuel in cooking, high rates of tobacco consumption (particularly bidi and hookah), and occupational dust exposure—significantly amplify the national burden. Tamil Nadu, the setting for the present study, witnesses elevated COPD prevalence in both rural biomass-exposed communities and urban industrial populations.

The management of COPD rests on two complementary pillars: pharmacological and non-pharmacological interventions[4]. While inhaled bronchodilators and corticosteroids attenuate symptoms and reduce exacerbation frequency, they do not halt disease progression[4]. Non-pharmacological strategies—particularly pulmonary rehabilitation incorporating structured breathing exercises—have emerged as indispensable adjuncts. Techniques such as pursed-lip breathing, diaphragmatic breathing, and incentive spirometry-based training have demonstrated capacity to reduce dyspnea severity, augment inspiratory muscle strength, and improve exercise tolerance[8]. Furthermore, nurse-led respiratory guidance programmes have been shown to enhance patient self-management, reduce hospitalisation rates, and meaningfully improve health-related quality of life (HRQoL).

Despite this evidence base, a substantial proportion of COPD patients in Indian healthcare settings do not access structured pulmonary rehabilitation, often due to service unavailability, patient unawareness, and poor adherence. Bedside nurse-delivered respiratory guidance offers a practical, scalable alternative that bridges this gap. However, rigorous evaluations of such programmes within Indian hospital populations remain sparse, particularly for patients with Stage I and Stage II disease.

Statement of the problem

A Quasi Experimental Study to Evaluate the Effectiveness of Respiratory guidance on Respiratory status and Health related Quality of life among patients with Chronic obstructive pulmonary disease in Selected Private Hospitals, Coimbatore.

Objectives

Primary objectives: (1) To assess and compare pre- and post-intervention scores of respiratory status and HRQoL between the intervention and control groups. (2) To evaluate the effectiveness of respiratory guidance on dyspnea severity, lung capacity, and HRQoL in the intervention group.

Secondary objectives: (3) To correlate respiratory status parameters with HRQoL in both groups. (4) To examine associations between selected demographic variables and respiratory status and HRQoL outcomes.

Research Hypotheses:

H_1: There is a significant difference between mean pretest and post-test scores of respiratory status and health-related quality of life among patients with chronic obstructive pulmonary disease in intervention group at $p \leq 0.05$ level.

H_2: There is a significant difference between mean post-test scores of respiratory status and health-related quality of life among patients with chronic obstructive pulmonary disease in intervention group and control group at $p \leq 0.05$ level.

H_3: There is a significant correlation between respiratory status and health-related quality of life among patients with chronic obstructive pulmonary disease in intervention group and control group at $p \leq 0.05$ level.

H_4: There is a significant association of the pretest mean scores of respiratory status and health-related quality of life with the selected demographic variables of patients with chronic obstructive pulmonary disease in intervention group and control group at $p \leq 0.05$ level.

METHODS

Research Design and Setting

A quasi-experimental, pre-test post-test control group design was adopted. The intervention group was enrolled at Raja Hospital, Coimbatore and control group was enrolled at Sumith hospital, Coimbatore. Both hospitals offered standardized pharmacological management for COPD, ensuring that group differences in outcome were attributable to the respiratory guidance rather than disparities in routine care. Data was collected from January 2024 to March 2024.

Sample and Sampling Technique

The pilot study population comprised adult patients with a confirmed diagnosis of COPD Stage I or Stage II as classified by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria. Non-probability purposive sampling was employed. Sample size was 15 in control and 15 in intervention group

Inclusion criteria specified patients aged 35–65 years who were clinically stable, willing to participate, scheduled for follow-up after discharge, and literate in Tamil or English. Patients were excluded if they were in acute exacerbation, had significant cognitive or communicative impairment, suffered from cardiac co-morbidities, had previously undergone lung surgery, or carried a diagnosis of active tuberculosis, malignant lung disease, or severe hepatorenal dysfunction.

Measurement Tools

Three validated instruments were used alongside a structured demographic interview schedule. Dyspnea severity was quantified using the Modified Borg Dyspnea Scale (MBS), a ten-point numerical scale originally introduced by Gunnar Borg in 1982. The MBS employs a self-rating principle in which patients independently report perceived breathlessness intensity. Test–retest reliability of the MBS has been established at correlation coefficients ranging from 0.75 to 0.90.

Lung capacity was assessed through observation of performance on a three-ball incentive spirometer, in which elevation of one, two, or three balls corresponds to inspiratory flow capacities of 600, 900, and 1,200 cc/minute, respectively. Inter-rater reliability of this measurement approach was $r = 0.80$.

Health-related quality of life was evaluated using the St. George's Respiratory Questionnaire–COPD version (SGRQ-C), a 40-item disease-specific instrument developed by Jones and Forde in 2007. The SGRQ-C captures three domains—symptoms, activity, and impact—plus a total score, each expressed as a percentage from 0 (no health impairment) to 100 (maximum impairment). The instrument demonstrates high internal consistency (Cronbach $\alpha = 0.90$) and test–retest reproducibility (intraclass correlation coefficient $r = 0.80–0.90$). Content validity of the combined tool set was established through expert panel review spanning medical–surgical nursing, pulmonology, physiotherapy, psychiatric nursing, and nursing research, yielding a content validity index of 0.91. Institutional ethics committee clearance was obtained from Sri Gokulam Hospital, Salem, and written informed consent was secured from each participant prior to enrolment.

Intervention Protocol

Participants in the intervention group of the pilot study received a structured respiratory guidance, administered twice daily in 40-minute sessions throughout their inpatient stay and continued at home for one month post-

discharge. Adherence was reinforced through telephonic follow-up at least three times weekly. The intervention comprised six components delivered in sequence:

(i) Airway clearance technique: Effective coughing combined with gentle back-patting and chest-tapping to mobilize secretions, administered for approximately two minutes to optimize the patency of airways prior to subsequent exercises.

(ii) Pursed-lip breathing: Patients adopted a half-sitting or sitting position, inhaling slowly and deeply through the nose and exhaling in a controlled manner through constricted lips. An inhalation-to-exhalation ratio of 1:2 to 1:3 was maintained, practiced for a minimum of five minutes per session.

(iii) Diaphragmatic (abdominal) breathing: Patients practiced in standing or supine positions, with one hand on the chest and the other on the abdomen. Inhalation expanded the abdomen without significant thoracic excursion, while exhalation involved gentle abdominal compression. This component was performed for a minimum of ten minutes per session at the same inhalation-to-exhalation ratio.

(iv) Incentive spirometry training: Patients held the three-ball spirometer in the left hand and placed the right hand over the lower ribs. They inhaled through the mouthpiece slowly to elevate the balls as high as possible, sustained the breath for two to three seconds, and then exhaled slowly. Ten to fifteen repetitions were completed per session, occupying approximately five minutes.

(v) Breathing exercise-based movement training: A coordinated programme linking respiratory phases to body movements—including forward leaning, arm elevation, horizontal arm extension, forward arm stretching, 30-degree trunk rotation, and squatting—was administered for five minutes per session to integrate breathing control with functional movements.

(vi) Balloon-blowing exercise: Patients in a 90/90 hemi-bridge position performed slow nasal inhalation followed by forceful exhalation through pursed lips until the balloon reached approximately seven inches in diameter, as verified against a pre-marked reference. This component lasted ten minutes per session to facilitate diaphragmatic zone-of-apposition maintenance.

Control group participants received routine pharmacological care and standard incentive spirometry usage without the structured respiratory guidance.

Data Collection and Statistical Analysis

Pre-test was completed on the day of admission after clinical stabilization. Post-test was conducted on the 30th day of follow-up for both groups. Frequency distribution, percentage, mean, and standard deviation were computed for descriptive purposes. The Wilcoxon signed-rank test and Mann-Whitney U test were applied for paired and independent non-parametric comparisons respectively (given the non-normal distribution of outcome scores); paired and independent t-tests were used where data were normally distributed. Correlations between outcome variables were examined with the Karl Pearson coefficient. Associations between demographic variables and clinical outcomes were assessed using chi-square. Statistical significance was set at $p \leq 0.05$.

RESULTS AND DISCUSSION

The pilot study included 30 COPD patients, with 15 in the intervention group and 15 in the control group.

Socio-demographic characteristics

The majority of participants in both groups were males, and most belonged to the age group below 55 years. Most participants were Hindus, had at least primary or secondary education, and were engaged in occupations such as farming, coolie work, or driving.

The two groups were comparable at baseline. Statistical testing showed no significant difference between the intervention and control groups in age, sex, religion, education, occupation, residence, BMI, hereditary lung

infection, social habit, smoking duration, area of work, comorbidity, diet pattern, allergen exposure, exercise, or duration of exercise. This indicates that the groups were homogeneous before the intervention.

Table 1 Socio-demographic characteristics of participants

Variable	Intervention (n=15)	Control (n=15)	p-value	Interpretation
Age <50 years	7 (46.67%)	2 (13.33%)	0.11	NS
Male	15 (100.00%)	13 (86.67%)	0.14	NS
Hindu	15 (100.00%)	13 (86.67%)	0.14	NS
High school education	6 (40.00%)	6 (40.00%)	0.88	NS
Farmer	6 (40.00%)	4 (26.67%)	0.62	NS
Urban residence	7 (46.67%)	10 (66.67%)	0.17	NS
Normal BMI	7 (46.67%)	11 (73.33%)	0.30	NS
Dust allergen	9 (60.00%)	9 (60.00%)	0.80	NS
Exercise yes	5 (33.33%)	5 (33.33%)	1.00	NS

NS = not significant

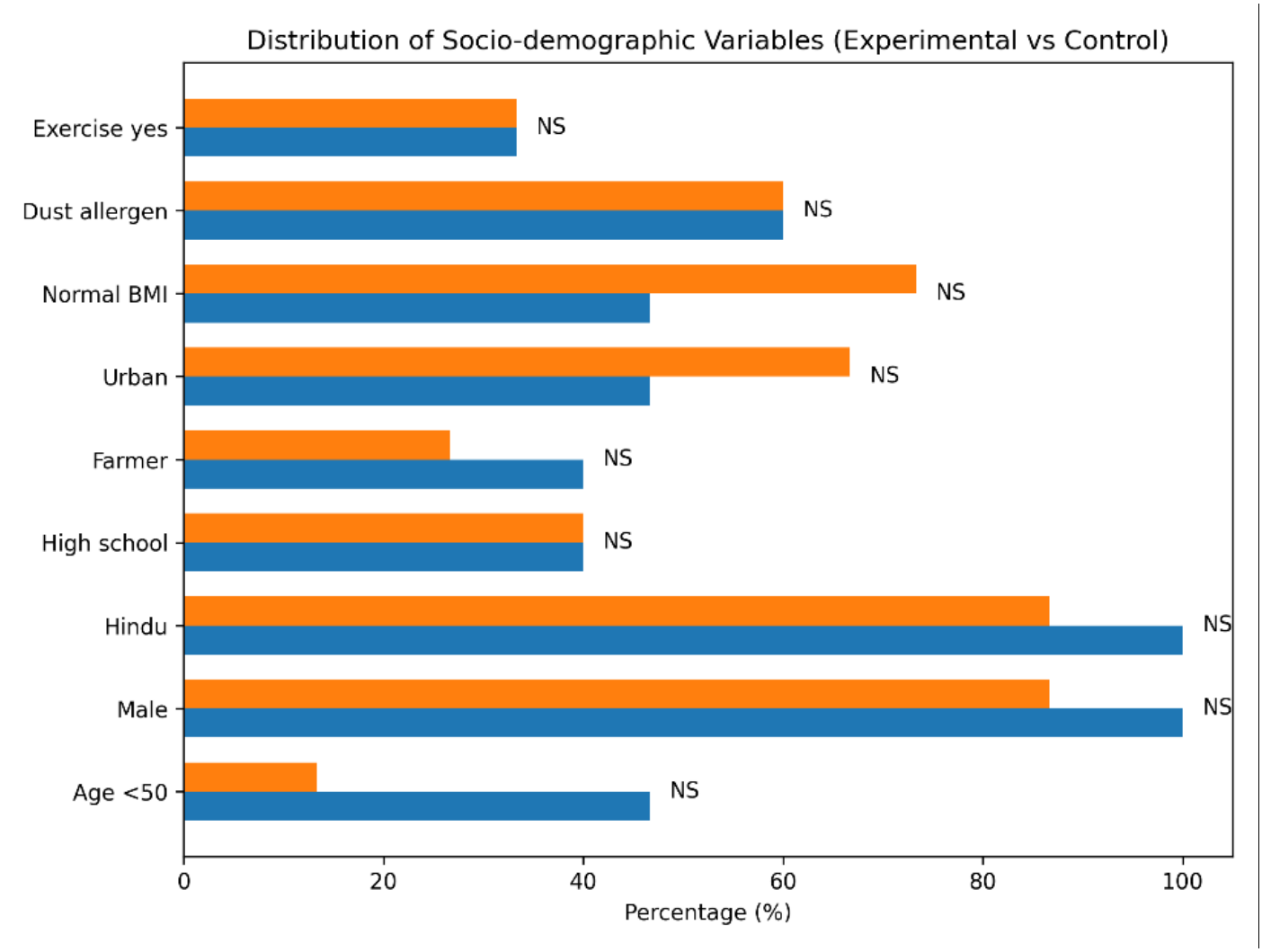

Figure 1

Baseline respiratory status and HRQOL

At pretest, the majority of participants in both groups had moderate dyspnea. There was no statistically significant difference between the intervention and control groups at baseline. This suggests that both groups had a similar respiratory burden before respiratory guidance was introduced.

Lung capacity at pretest was also similar in both groups. Most participants in the intervention group had a lung capacity score of 600 cc, while a small number had 900 cc. The control group showed a similar pattern. No significant difference was found between the groups.

Health-related quality of life was poor in both groups at baseline, with most participants classified as having moderate or severe impairment. The pretest comparison showed no significant difference between the experimental and control groups.

Table 2 Baseline comparison of outcome measures

Outcome	Intervention Mean ± SD	Control Mean ± SD	p-value	Interpretation
Dyspnea pretest	3.60±0.83	3.47±0.92	0.67	NS
Lung capacity pretest	620.00±137.46	640.00±105.50	0.56	NS
HRQOL pretest	65.66±26.69	64.15±21.37	0.87	NS

NS = not significant

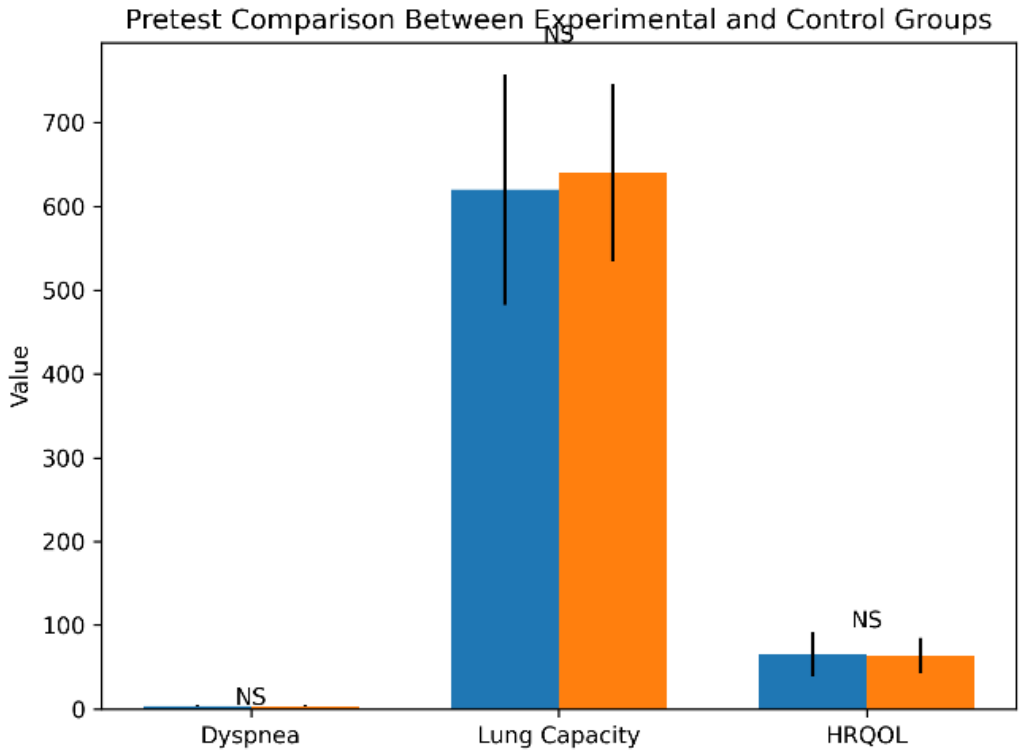

Figure 2

Post-intervention findings

After the intervention, the intervention group showed a marked reduction in dyspnea. More participants in the intervention group reported no dyspnea or only very slight dyspnea, while the control group continued to report slight to moderate dyspnea. The posttest comparison showed a statistically significant difference between the groups.

Lung capacity improved substantially in the experimental group after respiratory guidance. A larger proportion of participants achieved 900 cc and 1200 cc capacity scores in the intervention group, whereas most participants in the control group remained at 600 cc or 900 cc. This difference was statistically significant.

Health-related quality of life also improved significantly in the intervention group. After the intervention, most participants shifted from severe impairment to mild or moderate impairment, while the control group continued

to show moderate to very severe impairment. The posttest difference between the groups was statistically significant.

Table 3 Post test comparison of outcome measures

Outcome	Intervention Mean±SD	Control Mean±SD	Mean difference	p-value	Interpretation
Dyspnea	1.47±1.65	3.17±1.28	1.70	0.01	S
Lung capacity (cc)	960.00±124.21	704.00±144.26	256.00	0.001	S
HRQOL score	37.79±12.65	60.77±20.88	22.98	0.001	S

S = significant

Within-group comparison

In the intervention group, there was a significant reduction in dyspnea from pretest to posttest. The mean dyspnea score decreased from 3.60 to 1.47, indicating a meaningful improvement in respiratory comfort.

In the control group, dyspnea showed only a small and non-significant change from pretest to posttest. This suggests that improvement did not occur naturally to the same extent without the intervention.

Lung capacity improved significantly in the intervention group from 620.00 cc to 960.00 cc. The control group showed only a small increase, which was not statistically significant.

HRQOL improved significantly in the intervention group, with the mean score decreasing from 65.66 to 37.79. In contrast, the control group showed only a minimal and non-significant change.

Table 4 Within-group change from pretest to posttest

Outcome	Group	Pretest Mean±SD	Posttest Mean±SD	Mean difference	p-value	Interpretation
Dyspnea	Intervention	3.60±0.83	1.47±1.65	2.13	0.001	S
Dyspnea	Control	3.47±0.92	3.17±1.28	0.30	0.07	NS
Lung capacity	Intervention	620.00±137.46	960.00±124.21	340.00	0.001	S
Lung capacity	Control	640.00±105.50	704.00±144.26	64.00	0.06	NS
HRQOL	Intervention	65.66±26.69	37.79±12.65	27.87	0.01	S
HRQOL	Control	64.15±21.37	60.77±20.88	3.38	0.33	NS

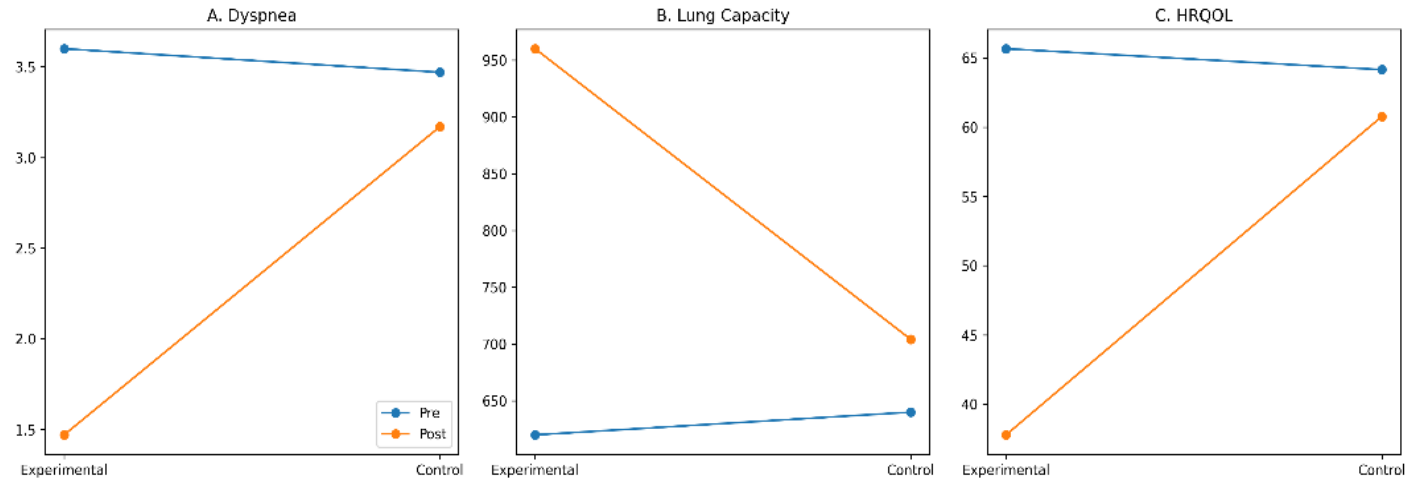

Figure 3

Correlation findings

In the experimental group, a significant moderate positive correlation was found between dyspnea reduction and HRQOL improvement. This indicates that as breathlessness decreased, quality of life improved.

A significant moderate positive correlation was also observed between lung capacity gain and HRQOL improvement. This suggests that better lung function was associated with better perceived quality of life.

A further significant moderate positive correlation was found between dyspnea reduction and lung capacity gain. This shows that improvement in one respiratory outcome was associated with improvement in the other.

In the control group, the correlations between the variables were weak and not statistically significant. This indicates that the observed pattern of improvement was not present without respiratory guidance.

Table 5 Correlation among gain scores

Correlation	Intervention r	p-value	Interpretation	Control r	p-value	Interpretation
HRQOL reduction vs dyspnea reduction	0.42	0.05	Moderate positive	0.19	0.33	NS
HRQOL reduction vs lung capacity gain	0.48	0.05	Moderate positive	0.18	0.22	NS
Lung capacity gain vs dyspnea reduction	0.36	0.05	Moderate positive	0.16	0.42	NS

DISCUSSION

Baseline comparability

The baseline similarity between the intervention and control groups strengthens the internal validity of the study. Since the two groups were not significantly different before the intervention, the observed posttest changes are more likely to be related to respiratory guidance rather than pre-existing differences.

This is important in a quasi-experimental design because group equivalence helps support the interpretation of intervention effects. The homogeneity of demographic and clinical variables suggests that the sample was suitably balanced for comparison.

Effect on dyspnea

The significant reduction in dyspnea in the intervention group indicates that respiratory guidance was effective in improving breathing comfort. Dyspnea is one of the most distressing symptoms in COPD and directly affects physical activity and daily functioning.

The finding suggests that guided breathing strategies, possibly combined with patient education and practice, helped patients manage breathlessness more effectively. The absence of similar improvement in the control group further supports the role of the intervention.

Effect on lung capacity

The substantial improvement in lung capacity in the intervention group demonstrates a positive physiological effect of respiratory guidance. Improved lung capacity may reflect better use of inspiratory muscles, improved breathing technique, and greater patient engagement in respiratory exercises.

Because the control group did not show comparable improvement, the effect appears to be intervention-related rather than due to spontaneous recovery. This supports the usefulness of respiratory guidance as a supportive measure in COPD care.

Effect on HRQOL

The improvement in health-related quality of life is a meaningful outcome because COPD affects not only physical symptoms but also emotional well-being and social functioning. The reduction in HRQOL impairment suggests that participants experienced less limitation in daily activities after the intervention.

The relationship between reduced dyspnea, increased lung capacity, and improved HRQOL indicates that the intervention had both physical and psychosocial benefits. This is especially important in chronic disease management, where symptom control alone may not fully capture patient improvement.

Correlation of outcomes

The significant positive correlations among dyspnea reduction, lung capacity gain, and HRQOL improvement in the intervention group provide additional evidence of intervention effectiveness. These results show that respiratory improvement was associated with better overall functioning and perceived well-being.

The weak and non-significant correlations in the control group suggest that similar improvements did not occur in the absence of the intervention. This reinforces the conclusion that respiratory guidance contributed meaningfully to the observed benefits.

Clinical implication

The findings indicate that respiratory guidance can be considered a useful non-pharmacological intervention for COPD patients. It may help reduce breathlessness, improve lung function, and enhance quality of life.

In clinical practice, such guidance can be incorporated into nursing care and patient education programs. The pilot study therefore provides preliminary support for larger-scale implementation and further research.

CONCLUSION

The pilot study demonstrated that the experimental group improved significantly in dyspnea, lung capacity, and HRQOL after respiratory guidance, while the control group showed no comparable change. The baseline similarity between the groups and the significant correlations among outcome measures strengthen the interpretation that the intervention was effective.

Thus pilot study provides robust evidence that a structured, nurse-administered respiratory guidance—comprising airway clearance, pursed-lip breathing, diaphragmatic breathing, incentive spirometry training, coordinated breathing exercises, and balloon-blowing—significantly and meaningfully reduces dyspnea severity, improves lung capacity, and health-related quality of life in patients with Stage I and Stage II COPD over a one-month intervention period .

The significant inter-variable correlations observed exclusively in the intervention group following treatment suggest that the intervention initiates a positive therapeutic cascade in which dyspnea reduction, lung capacity improvement, and quality-of-life enhancement mutually reinforce one another .

The pilot study suggests that respiratory guidance is a promising strategy for improving respiratory status and quality of life in COPD patients. The findings justify further investigation with a larger sample and extended follow-up.

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