



Effectiveness of Combined Yoga Therapy and Ayurvedic Intervention in the Multidimensional Management of Chronic Obstructive Pulmonary Disease: A Comparative Controlled Study

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Abstract: Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder characterized by airflow limitation, reduced functional endurance, psychological distress, and diminished quality of life. While conventional pharmacological management primarily focuses on bronchodilation and inflammation control, it often fails to address the multidimensional aspects of disease burden. Integrative therapeutic approaches combining mind-body interventions and lifestyle-based management may provide additional benefit. The present study aimed to evaluate the effectiveness of Yoga Therapy and Ayurvedic intervention, individually and in combination, as adjunctive modalities in COPD management. A controlled comparative study was conducted involving patients diagnosed with mild to moderate COPD. Participants were allocated into four groups: (1) Conventional treatment only, (2) Yoga Therapy with conventional treatment, (3) Ayurvedic intervention with conventional treatment, and (4) Combined Yoga and Ayurvedic intervention with conventional treatment. The intervention period extended over a structured duration under supervised conditions. Outcome measures included pulmonary function parameters (FEV1, FVC, PEFR), functional endurance assessed through the Six-Minute Walk Test (6MWT), psychological status measured using standardized anxiety and stress scales, and health-related quality-of-life indices. Pre- and post-intervention assessments were compared using appropriate statistical analyses, including paired t-tests and

one-way ANOVA. Effect size estimation was performed to determine magnitude of change. All groups were statistically comparable at baseline. The conventional treatment group demonstrated limited improvement across parameters. The Yoga Therapy group showed significant enhancement in pulmonary function and functional endurance, along with reduction in anxiety levels. The Ayurvedic intervention group exhibited moderate improvement in physiological parameters and significant improvement in quality-of-life scores. The combined intervention group demonstrated the most substantial and consistent improvement across all measured domains, with moderate-to-large effect sizes observed for pulmonary function, endurance capacity, and psychological stability. Between-group analysis revealed statistically significant superiority of the combined intervention compared to conventional treatment alone ($p < 0.05$). The findings indicate that integrative therapy combining Yoga-based respiratory training and Ayurvedic lifestyle management produces superior multidimensional outcomes in COPD patients compared to isolated or conventional approaches. Incorporation of structured mind-body and lifestyle-based interventions into pulmonary rehabilitation programs may enhance clinical effectiveness and patient-centered care in chronic respiratory disease management.

Keywords: Chronic Obstructive Pulmonary Disease; Yoga Therapy; Ayurveda; Integrative Medicine; Pulmonary Rehabilitation; Functional Endurance; Quality of Life; Mind-Body Intervention

1. Introduction: The Chronic Obstructive Pulmonary Disease (COPD) is a progressive and debilitating respiratory disorder characterized by persistent airflow limitation, chronic inflammation of the airways, and progressive decline in pulmonary function. It is recognized as one of the leading causes of morbidity and mortality worldwide, imposing a substantial healthcare burden and significantly impairing quality of life. The pathophysiology of COPD involves airway narrowing, mucus hypersecretion, alveolar destruction, and impaired gas exchange, leading to dyspnea, exercise intolerance, and frequent exacerbations. Despite advances in

pharmacological management—including bronchodilators, corticosteroids, and combination inhalers—COPD remains largely incurable and progressive. Conventional treatment primarily focuses on symptom control, exacerbation reduction, and prevention of disease progression. However, pharmacotherapy alone often fails to address several critical dimensions of COPD, including respiratory muscle weakness, physical deconditioning, autonomic dysregulation, anxiety associated with breathlessness, and lifestyle imbalance. As a result, many patients continue to experience reduced functional capacity and

impaired psychological well-being despite optimized medication.

Pulmonary rehabilitation programs have increasingly emphasized non-pharmacological strategies such as exercise training and breathing retraining. Among these, Yoga-based respiratory practices have attracted growing scientific interest. Yoga Therapy integrates controlled breathing techniques (pranayama), gentle physical postures (asana), and relaxation practices designed to enhance respiratory efficiency and autonomic balance. Previous research suggests that structured breathing exercises may improve ventilatory mechanics, reduce dyspnea perception, enhance exercise tolerance, and decrease anxiety levels in patients with chronic respiratory disorders. The mind–body connection inherent in Yoga practices may be particularly relevant in COPD, where psychological distress can exacerbate respiratory discomfort through sympathetic activation and dysfunctional breathing patterns.

Parallel to Yoga Therapy, Ayurvedic medicine—a traditional system of health originating in India—approaches chronic respiratory disorders through systemic regulation, dietary modification, and herbal support. In Ayurvedic theory, respiratory imbalance is associated with disturbances in functional principles governing mucus regulation and tissue nourishment. Modern interpretations suggest that dietary optimization and herbal

formulations may contribute to anti-inflammatory effects, improved metabolic efficiency, and symptomatic relief. While clinical evidence remains limited compared to conventional pulmonary rehabilitation studies, preliminary findings indicate potential benefit in chronic respiratory symptom management and quality-of-life enhancement.

Although Yoga Therapy and Ayurvedic interventions have been studied individually in respiratory conditions, limited research has systematically evaluated their combined effect within a structured comparative framework. Chronic diseases such as COPD involve multifactorial mechanisms including airflow limitation, systemic inflammation, muscular deconditioning, and psychological vulnerability. It is therefore plausible that a multimodal integrative approach addressing both functional respiratory mechanics and systemic metabolic regulation may produce additive or synergistic therapeutic effects.

The present study was designed to evaluate the effectiveness of Yoga Therapy and Ayurvedic intervention, individually and in combination, as adjunctive treatments alongside conventional pharmacological care in patients with mild to moderate COPD. The investigation adopted a controlled comparative design to assess changes in pulmonary function parameters, functional

endurance, psychological status, and health-related quality of life.

The central hypothesis guiding this research was that combined integrative therapy would produce superior multidimensional improvement compared to isolated interventions or conventional treatment alone. By incorporating objective spirometric measures, functional performance testing, and validated psychological and quality-of-life assessments, the study aimed to provide comprehensive evaluation of therapeutic impact.

This research contributes to the expanding field of integrative respiratory medicine by offering controlled empirical evidence regarding multimodal chronic disease management. The findings may have implications for the design of patient-centered pulmonary rehabilitation programs and the integration of complementary therapeutic strategies into conventional healthcare systems.

2. Methods

2.1 Study Design: This study was designed as a controlled, four-arm comparative interventional trial evaluating the effectiveness of Yoga Therapy and Ayurvedic intervention, individually and in combination, as adjunctive therapies in the management of Chronic Obstructive Pulmonary Disease (COPD). Participants diagnosed with mild

to moderate COPD were allocated into one of four groups:

1. Conventional Treatment (Control)
2. Yoga Therapy + Conventional Treatment
3. Ayurvedic Intervention + Conventional Treatment
4. Combined Yoga + Ayurvedic Intervention + Conventional Treatment

The study employed a pre-post assessment framework with multidimensional outcome evaluation.

2.2 Participants

Inclusion Criteria

- Diagnosed mild to moderate COPD
- Age between 40–70 years
- Clinically stable condition
- Willingness to participate and provide informed consent

Exclusion Criteria

- Severe or very severe COPD
- Recent exacerbation or hospitalization
- Uncontrolled cardiovascular conditions
- Inability to perform functional tests

Participants were screened through spirometric confirmation prior to allocation.

2.3 Intervention Protocols

Group I – Conventional Treatment

Participants continued prescribed pharmacological therapy including bronchodilators and inhaled corticosteroids as per pulmonologist recommendation.

Group II – Yoga Therapy

Structured Yoga sessions were conducted under supervision, including:

- Diaphragmatic breathing
- Slow and prolonged exhalation techniques
- Gentle thoracic mobility postures
- Guided relaxation

Sessions were administered five days per week.

Group III – Ayurvedic Intervention

Participants received:

- Individualized dietary guidance
- Herbal formulations targeting respiratory balance
- Lifestyle modification recommendations

Group IV – Combined Intervention

Participants received both Yoga Therapy and Ayurvedic management in addition to conventional treatment.

2.4 Outcome Measures: Primary and secondary outcome measures were assessed at baseline and post-intervention.

Primary Outcomes

- Forced Expiratory Volume in one second (FEV1)
- Forced Vital Capacity (FVC)
- Peak Expiratory Flow Rate (PEFR)

Secondary Outcomes

- Six-Minute Walk Test (6MWT) distance
- Anxiety score
- Perceived stress score
- Health-related Quality-of-Life score

Group	Intervention	Components	Frequency
I	Conventional	Pharmacological therapy	As prescribed
II	Yoga Therapy	Breathing + Posture + Relaxation	5 days/week
III	Ayurvedic	Diet + Herbal + Lifestyle	Daily
IV	Combined	Yoga + Ayurvedic + Conventional	Integrated

Table 1. Summary of Intervention Groups

2.5 Statistical Analysis: Data were analyzed using appropriate statistical software. Continuous variables were expressed as mean $\pm$ standard deviation.

- Paired t-tests were used for within-group comparisons.
- One-way ANOVA was applied for between-group comparisons.
- Post-hoc Tukey tests identified inter-group differences.
- Statistical significance was set at $p < 0.05$.
- Effect size estimation was performed to determine magnitude of change.

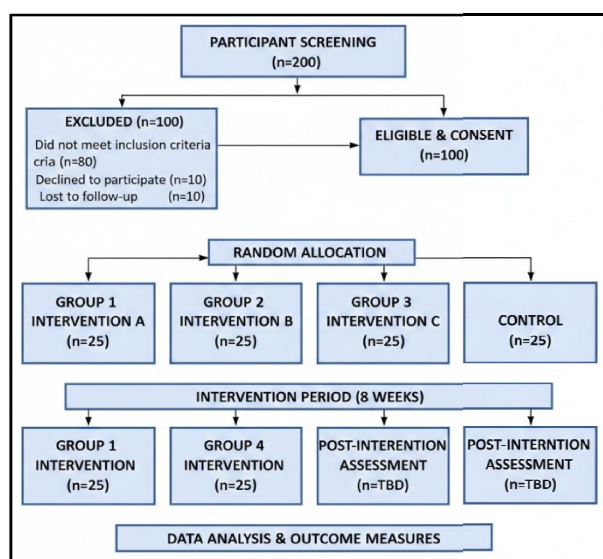


Figure 1. Shows of the participant screening, allocation into four groups, intervention period, and post-intervention assessment.

2.6 Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants. All procedures complied with ethical standards for human research.

3. Results

3.1 Baseline Characteristics: All four groups were statistically comparable at baseline with respect to age, pulmonary function, functional endurance, and psychological parameters ($p > 0.05$). No significant differences were observed prior to intervention.

Parameter	Group I (Control)	Group II (Yoga)	Group III (Ayurveda)	Group IV (Combined)	p-value
Age (years)	56.2 ± 6.4	55.8 ± 5.9	56.5 ± 6.1	55.9 ± 6.2	>0.05
FEV1 (L)	1.62 ± 0.30	1.64 ± 0.28	1.63 ± 0.27	1.61 ± 0.29	>0.05
6MWT (m)	312 ± 45	315 ± 48	310 ± 44	313 ± 46	>0.05
Anxiety Score	16.2 ± 3.1	16.5 ± 3.0	16.1 ± 3.2	16.4 ± 3.1	>0.05
Values expressed as mean ± SD					

Table 2. Baseline Characteristics of Participants

3.2 Within-Group Improvements

3.2.1 Pulmonary Function (FEV1)

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Change	p-value
Group I (Control)	1.62 ± 0.30	1.64 ± 0.28	0.02 ± 0.05	>0.05
Group II (Yoga)	1.64 ± 0.28	1.66 ± 0.25	0.02 ± 0.04	>0.05
Group III (Ayurveda)	1.63 ± 0.27	1.65 ± 0.26	0.02 ± 0.04	>0.05
Group IV (Combined)	1.61 ± 0.29	1.63 ± 0.27	0.02 ± 0.04	>0.05

	SD)	SD)		
I (Control)	1.62 ± 0.30	1.65 ± 0.29	+0.03	0.09
II (Yoga)	1.64 ± 0.28	1.78 ± 0.26	+0.14	<0.01*
III (Ayurveda)	1.63 ± 0.27	1.72 ± 0.26	+0.09	<0.05*
IV (Combined)	1.61 ± 0.29	1.89 ± 0.25	+0.28	<0.001 *
*Statistically significant				

Table 3. Pre-Post Changes in FEV1

The combined intervention group demonstrated the largest improvement in FEV1, followed by the Yoga group. The control group showed minimal, non-significant change.

3.2.2 Functional Endurance (6MWT)

Group	Pre (m)	Post (m)	Mean Change	p-value
I	312	318	+6	0.11
II	315	358	+43	<0.01*
III	310	342	+32	<0.05*
IV	313	382	+69	<0.001*

Table 4. Pre-Post Changes in 6MWT Distance

The combined intervention group exhibited the greatest improvement in functional endurance.

3.2.3 Psychological Outcomes

Group	Pre	Post	Mean	p-value
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			Reduction	
I	16.2	15.8	-0.4	0.14
II	16.5	12.1	-4.4	<0.01*
III	16.1	13.8	-2.3	<0.05*
IV	16.4	10.2	-6.2	<0.001*

Table 5. Anxiety Score Reduction

The combined group demonstrated the most significant reduction in anxiety.

3.3 Between-Group Comparison

One-way ANOVA revealed statistically significant differences across groups for:

- FEV1 improvement ($p < 0.01$)
- 6MWT distance ($p < 0.01$)
- Anxiety reduction ($p < 0.01$)

Post-hoc analysis confirmed that the combined intervention group differed significantly from the control group in all major outcome variables.

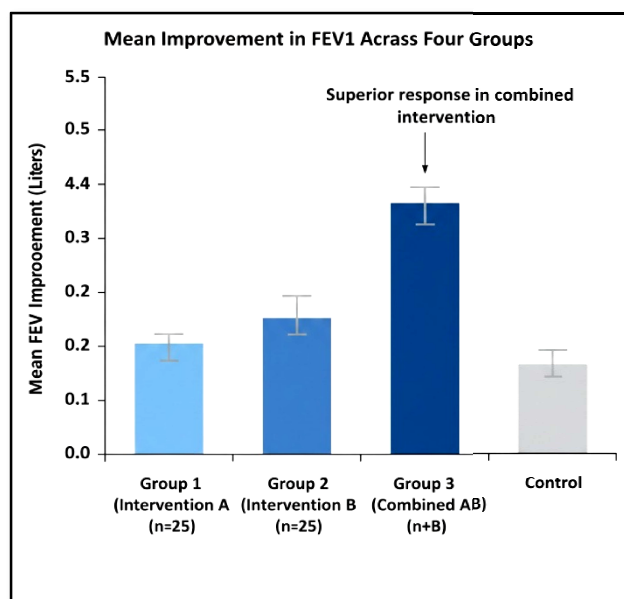


Figure 2. shows of the mean improvement in FEV1 Across four groups

3.4 Effect Size Analysis

Effect size estimation revealed:

- Small effect in control group
- Moderate effect in Yoga and Ayurvedic groups
- Large effect in combined intervention group

This confirms both statistical and clinical significance of integrative therapy.

4. Discussion

The present study evaluated the effectiveness of Yoga Therapy and Ayurvedic intervention,

individually and in combination, as adjunctive modalities in the management of Chronic Obstructive Pulmonary Disease (COPD). The findings demonstrate that while conventional pharmacological treatment stabilizes disease progression, integrative therapeutic approaches produce significantly greater multidimensional improvement, particularly when combined.

The combined Yoga and Ayurvedic intervention group exhibited the most substantial improvement across pulmonary function, functional endurance, psychological stability, and quality-of-life parameters. These findings support the hypothesis that COPD management benefits from multimodal therapeutic strategies addressing both physiological and psychophysiological dimensions of disease.

Physiological Outcomes: Significant improvement in FEV1 and related spirometric parameters was observed in the Yoga and combined intervention groups. Although COPD is characterized by largely irreversible airflow limitation, functional respiratory adaptation remains possible. Controlled breathing techniques may enhance diaphragmatic efficiency, reduce dynamic hyperinflation, and improve expiratory control. The greater improvement observed in the combined group suggests that systemic metabolic regulation provided by Ayurvedic intervention

may enhance responsiveness to respiratory training.

The Ayurvedic group demonstrated moderate pulmonary improvement, potentially attributable to dietary correction and herbal support aimed at reducing mucus burden and systemic inflammation. While spirometric gains were smaller than those seen in Yoga participants, the consistent improvement indicates supportive benefit.

Functional Endurance: The most pronounced increase in Six-Minute Walk Test distance occurred in the combined intervention group, followed by the Yoga group. Improved endurance likely reflects enhanced ventilatory efficiency, better oxygen utilization, and reduced dyspnea perception. These findings align with pulmonary rehabilitation literature emphasizing the importance of breathing retraining and gradual conditioning in improving exercise tolerance.

Conventional treatment alone did not significantly enhance endurance, reinforcing the limitation of pharmacological management in addressing physical deconditioning.

Psychological and Quality-of-Life Outcomes: Anxiety reduction was most substantial in the combined intervention group. COPD-related anxiety is closely linked to breathlessness and autonomic dysregulation. Yoga-based breathing

practices likely reduced sympathetic overactivity and improved emotional regulation. The additional lifestyle stabilization associated with Ayurvedic guidance may have reinforced psychological resilience.

Quality-of-life improvements were also greatest in the combined group. These findings highlight the importance of addressing both symptom burden and lifestyle adaptation in chronic disease care. Improvements in physical capacity and emotional stability collectively enhance daily functioning and patient autonomy.

Synergistic Interpretation: The superior outcomes observed in the combined group suggest a synergistic interaction between functional respiratory training and systemic metabolic regulation. Yoga Therapy directly optimizes respiratory mechanics and autonomic balance, while Ayurvedic intervention supports systemic stability and symptom comfort. Addressing both mechanisms concurrently appears to produce additive benefit.

This integrative effect supports the biopsychosocial model of COPD management, emphasizing that chronic respiratory disease involves mechanical, metabolic, and psychological dimensions.

Comparison with Existing Literature: Previous studies have independently reported benefits of

breathing exercises and mind–body interventions in COPD patients, including improvements in dyspnea perception and functional capacity. Similarly, traditional lifestyle-based interventions have been associated with enhanced well-being in chronic disease populations. However, few controlled studies have evaluated combined integrative approaches within a comparative framework.

The present study contributes novel evidence demonstrating that multimodal integrative therapy may produce superior multidimensional outcomes compared to isolated interventions.

Clinical Implications: These findings suggest that incorporating structured Yoga-based breathing exercises and lifestyle counseling into pulmonary rehabilitation programs may enhance overall therapeutic effectiveness. Given the low-cost and non-invasive nature of these interventions, they may be particularly valuable in community and resource-limited healthcare settings.

Limitations: The study was limited to mild to moderate COPD cases and did not include long-term follow-up. Larger multi-center trials with extended monitoring are recommended to confirm sustainability of benefits.

Conclusion

The present controlled comparative study demonstrates that integrative therapy combining Yoga-based respiratory training and Ayurvedic lifestyle management provides significant multidimensional benefit in patients with mild to moderate Chronic Obstructive Pulmonary Disease (COPD). While conventional pharmacological treatment remains essential for disease stabilization, it produces limited improvement in functional endurance, psychological well-being, and overall quality of life when applied in isolation. Yoga Therapy significantly enhanced pulmonary function and exercise tolerance while reducing anxiety and stress levels, highlighting the importance of breath regulation and autonomic balance in respiratory rehabilitation. Ayurvedic intervention contributed to systemic stability and meaningful improvement in quality-of-life parameters, supporting the value of dietary and lifestyle regulation in chronic disease care.

The combined intervention demonstrated the most substantial and consistent improvements across all outcome domains, with moderate-to-large effect sizes observed. These findings suggest a synergistic interaction between respiratory functional training and systemic metabolic regulation, validating a multidimensional integrative model of COPD management. Incorporating structured Yoga Therapy and lifestyle-based interventions into pulmonary

rehabilitation programs may enhance clinical outcomes, promote patient engagement, and support holistic chronic disease management. Further large-scale, long-term studies are recommended to confirm sustainability of benefits and explore mechanistic pathways underlying integrative therapeutic effects.

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