DOI: 10.7860/JCDR/2026/82448.23255

Original Article

Physiotherapy Section

Effectiveness of Manual Therapy in Patients with Obstructive Airway Disorders: A Scoping Review

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ABSTRACT

Introduction: Obstructive Airway Disorders (OAD) refer to a group of conditions that cause airflow limitation within the lungs, including chronic bronchitis, emphysema, asthma, and other related disorders. Manual Therapy (MT) has been suggested as a component of pulmonary rehabilitation programs for patients with OAD. MT may improve mobility in the thoracic region, thereby reducing the effort required for breathing by enhancing oxygen delivery and lymphatic circulation. Common MT techniques include massage, Myofascial Release (MFR), muscle energy techniques, ligament balancing, joint mobilisation, and manipulation.

Aim: To review the effectiveness of MT interventions, either alone or in combination with exercise, on lung function, exercise capacity, and quality of life in patients with OAD.

Materials and Methods: In the present scoping review, in accordance with PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines, a literature search was conducted across MEDLINE, EMBASE (Excerpta Medica Database), PEDro (Physiotherapy Evidence Database), and the Cochrane Central Register of Controlled Trials databases using the terms OAD, Chronic Obstructive Pulmonary Disease (COPD), MT, joint mobilisation, and osteopathic manipulation. Searches included all relevant studies available from 2005 to May 2024. The primary outcomes were lung function and exercise capacity, while secondary outcomes included symptoms, Quality of Life (QoL), and adverse events.

Results: Of the 1,400 articles screened, 10 met the inclusion criteria and were included in the review. A total of 441 participants were analysed, with ages ranging from 18 to 65 years. Interventions included Osteopathic Manipulative Therapy (OMT), massage, manual soft-tissue release, diaphragmatic release, and MFR. The mean age of participants was 38 years. The duration of rehabilitation ranged from 2 to 10 weeks. Various MT interventions-including soft-tissue release, MFR, Chuna therapy, joint mobilisation, and manual diaphragm release-when combined with conventional physiotherapy, resulted in significant improvements in pulmonary function parameters (Forced Expiratory Volume in one second (FEV_1) and Forced Vital Capacity (FVC) across different patient populations.

Conclusion: MT techniques improve QoL, lung function, exercise capacity, and respiratory symptoms, and reduce adverse events. Therefore, MT can be used as an adjunctive treatment modality in patients with OAD.

Keywords: Chiropractic, Chronic obstructive pulmonary disease, Physical therapy modalities, Respiratory function test

INTRODUCTION

The OADs are preventable and manageable respiratory conditions characterised by progressive airflow limitation, partially reversible airway obstruction, and lung hyperinflation. These disorders are associated with an abnormal inflammatory response of the lungs to harmful particles or gases and may also involve significant extrapulmonary effects, contributing to frequent and severe exacerbations in some individuals. OAD encompasses a group of diseases that impair airflow within the lungs, including chronic bronchitis, emphysema, asthma, and related conditions. Collectively, chronic respiratory diseases (COPD, asthma, and related conditions) account for approximately 32% of global Disability-Adjusted Life Years (DALYs), disproportionately affecting India [1].

Major extrapulmonary manifestations of OAD include altered chest wall mechanics and musculoskeletal dysfunction. Contraction of the cervicothoracic fascia around the chest wall leads to postural changes such as forward head posture, cervical hyperextension, increased thoracic kyphosis, and internal rotation of the shoulders. Several studies have documented distinct musculoskeletal differences in individuals with COPD compared to healthy controls. These musculoskeletal alterations can result in increased chest tightness, reduced inspiratory pressure and volume generation, and increased work of breathing. Respiratory muscle dysfunction is primarily attributed to pulmonary hyperinflation, which forces the diaphragm to operate at suboptimal lengths, thereby reducing muscle contraction efficiency relative to lung volume [2-7].

The MT is defined as a hands-on clinical approach that employs skilled techniques to address dysfunctions of the musculoskeletal system, soft tissues, and joints. The primary objectives of MT are to enhance physical function, reduce pain, and promote optimal movement patterns. Numerous studies suggest that MT can improve thoracic mobility, potentially reducing the effort required for breathing by improving oxygen delivery and lymphatic circulation. Common MT techniques include massage, MFR, muscle energy techniques, ligament balancing, joint mobilisation, and manipulation [8-10].

Pulmonary rehabilitation is a comprehensive intervention that integrates exercise training, education, and behavioural modification to improve physical and psychological well-being. Pulmonary rehabilitation has been shown to reduce dyspnoea, enhance exercise capacity, and improve QoL in individuals with COPD. It also leads to significant improvements in respiratory symptoms, physical performance, and Health-Related Quality of Life (HRQoL) in individuals with chronic respiratory diseases [11]. The 2013 ATS/ERS (American Thoracic Society/European Respiratory Society) statement on pulmonary rehabilitation [12] emphasises the importance of addressing postural alignment and improving mobility of the chest wall, spine, and shoulders as key components of treatment.

Despite these recommendations, there remains a paucity of literature evaluating the effectiveness of MT interventions in patients with OAD. Therefore, there is a need to establish evidence supporting the role of MT in this population.

The present study aimed to investigate the effectiveness of MT interventions, either alone or in combination with exercise training, delivered by any healthcare professional, on lung function, exercise capacity, and HRQoL in patients with COPD.

MATERIALS AND METHODS

The present scoping review was conducted in accordance with the PRISMA-ScR guidelines [13] (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews). A comprehensive literature search was performed across PubMed, EMBASE, Scopus, PEDro, Google Scholar, and ResearchGate by two independent investigators using a combination of Medical Subject Headings (MeSH) terms and keywords.

Search strategy: The final search included The final search included ("COPD" [MeSH] OR COPD OR OAD) AND ("musculoskeletal disease" OR posture) AND (manual therapy OR joint mobilisation OR osteopathic manipulation). Limits applied included studies published in the English language between 2005 and 2024 [Table/Fig-1]. Two independent reviewers conducted title, abstract, and full-text screening to determine study eligibility. Any disagreements were resolved through discussion or by consultation with a third reviewer.

Inclusion criteria:

- Prospective or retrospective intervention studies, including Randomised Controlled Trials (RCTs) and non-RCTs, involving patients with OAD;
- Studies published in the English language;
- Studies published between 2005 and 2024;
- Studies that included MT techniques as an intervention.

Exclusion criteria:

- Studies published in languages other than English;
- Studies not addressing the treatment of patients with OAD;
- Systematic reviews, conference abstracts, case studies, narrative reviews, and non-peer-reviewed studies;
- Articles without access to full text;
- Literature not involving MT techniques.

RESULTS

A literature search identified studies from PubMed (115 records), EMBASE (35 records), Scopus (45 records), PEDro (60 records), Google Scholar (1,100 records), and ResearchGate (45 records) published between 2005 and 2024 [Table/Fig-2]. Following screening, a total of 10 RCTs and non-RCTs were included in the review [Table/Fig-3] [14-23].

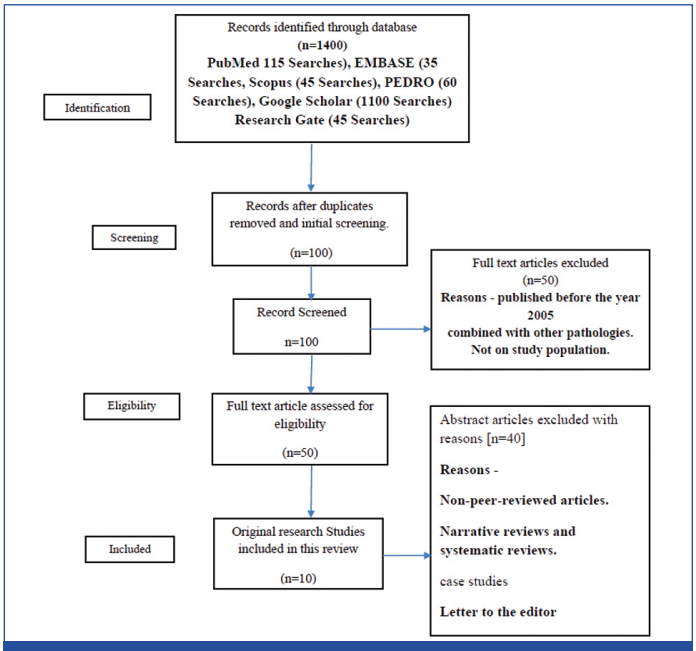
Data from 441 participants were analysed. The mean age of participants was 38 years, with an age range of 18-65 years. The duration of rehabilitation interventions ranged from 2 to 10 weeks.

For the assessment of lung function, primary outcome measures included spirometric parameters such as FEV_1, FVC, and the FEV_1/FVC ratio. One study also assessed chest expansion as an outcome measure [15]. Another study evaluated respiratory muscle strength using Maximal Inspiratory Pressure (MIP) [18,19,22]. Additionally, two studies used the St. George's Respiratory Questionnaire (SGRQ) to assess HRQoL [Table/Fig-3] [17,23].

Dutta DA et al., reported significant improvements in FEV_1 and FVC following the application of soft-tissue release manual therapy techniques administered twice weekly for eight weeks. Ahmad AM et al., observed significant improvements in FEV_1 and FVC after immediate MFR of the pectoralis minor muscle combined with

Searching Keywords	Pub Med	Scopus	PEDro	Google Scholar	EMBASE	Research Gate
Manual Therapy" OR "Joint Mobilisation" AND ("Chronic Obstructive Pulmonary Disease" OR "COPD" OR "Asthma" OR "Obstructive Airway Disorder") AND ("Physical Therapy Modalities" OR ("Respiratory Function Tests"	50	25	30	500	10	20
("chronic obstructive pulmonary disease" (MeSH) OR COPD OR OAD) AND ("musculoskeletal disease" OR posture) AND (manual therapy OR joint mobilisation OR osteopathic manipulation	30	5	6	200	10	5
Manual therapy in obstructive airway diseases" OR "Chiropractic treatment COPD" OR "Physiotherapy and respiratory function.	21	5	4	100	5	5
Manual Therapy" OR "Chiropractic" OR "Myofascial Release") AND ("COPD" OR "Asthma" OR "Obstructive Airway Disorder") AND ("Physical Therapy Modalities" OR "Rehabilitation") AND ("Respiratory Function Test*")	14	10	20	300	10	15

[Table/Fig-1]: Search strategy, keywords, and number of articles retrieved from each database.



[Table/Fig-2]: PRISMA flowchart summarising the selection process.

Study	Study design	Treatment groups	Outcome Measures	Follow-up	Rehabilitation program	Main results	Conclusion
Dutta DA et al., 2021[14]	Comparative study design	Experimental Group (COPD) and Control Group	Chest Expansion FEV1/FVC+	Eight weeks	Soft-Tissue Release Manual Therapy Techniques (STRMTT) twice weekly for 8 weeks	The comparative analysis of post-intervention means between the groups found a statistically significant difference	Soft-tissue release Manual Therapy (MT) techniques addressing the soft-tissue structure in subjects with moderate COPD showed statistically significant effect in improving chest expansion and FEV1/FEV6 when compared with the only conventional exercises.
Ahmad AM et al., 2018 [15]	Signle-blinded	Physiotherapy combined with MT + short-acting bronchodilator	FEV1, FVC, MVV, chest expansion	Immediate	Pectoralis minor muscle myofacial release and therapeutic strengthening exercises for shoulder depressors & scapular adductors,	FEV1, FVC, MVV, chest expansion, and VDS of pectoralis minor muscle tightness pain significantly improved only in group A (P<0.05).	A single physiotherapy intervention of Myofascial Release (MFR) -based MT combined with therapeutic exercise has succeeded to induce some clinical benefits in patients with COPD.
Cruz-Montecinos C et al., 2017 [16]	Non-RCT	Manual Therapy (MT)	RR, HR spo2	Immediate	soft-tissue MT protocol STMTP.	Residual volume decreased from 4.5 to 3.9 L (P=0.002), inspiratory capacity increased from 2.0 to 2.1 L (P=0.039) and SpO2 increased from 93% to 96% (P=0.001).	Single application of an STMTP appears to have the potential to produce immediate clinically meaningful improvements in lung function in patients with severe and very severe COPD.
Park J et al., 2024 [17]	Single-blind	CMT Chuna MT + Western medicine	FEV1 FVC, SGRQ++ CAT+++ 6MWD	Eight weeks	Chuna MT	The mean differences in FEV1 (L) between weeks 1 and 8 were statistically significant between the groups (p = 0.039). Additionally, the experimental group showed improved 6MWD, mMRC, VAS for dyspnea, CAT, SGRQ (total), and EQ-VAS scores than the control group	CMT has the potential to alleviate symptoms, improve quality of life, and delay the decline in lung function in patients with COPD.
Yilmaz Yelvar GD 2016 [18]	Single-Blinded RCT	MT	FEV1 FVC MIP$ HR RR	Immediate	Myofascial Release (MFR)	There was a significant improvement in the forced expiratory volume in the first second, forced vital capacity, and vital capacity values (P, 0.05). The Maximal Inspiratory Pressure (MIP) and maximal expiratory pressure values increased significantly after MT, compared to the pre-MT session (P, 0.05).	A single MT session immediately improved pulmonary function, inspiratory muscle strength, and oxygen saturation and reduced dyspnea, fatigue, and heart and respiratory rates in patients with severe COPD
López-de-Uralde-Villanueva I et al., 2018 [19]	Single-blinded, Randomised Controlled Trial (RCT)	IMT + IMT & MT + CPT (Asthma)	MIP, FEV1, FVC, FEV1/FVC	Six weeks	Joint mobilisation techniques (grades III and IV) and A manipulation technique.	For the per-protocol analysis, between-group differences at post-intervention were observed in maximum inspiratory pressure (19.77 cmH2O (11.49-28.04), P <.05.	The combined therapy focused on enhancing posture was superior for improving inspiratory musculature strength and forward head posture compared with inspiratory muscle training in isolation in patients with asthma
Nair A et al., 2019 [20]	Non - RCT	Diaphragmatic stretch + Manual diaphragm release	Diaphragmatic excursion	Immediate	2 sets of 10 deep breaths with 1-minute interval between the sets	There was no statistically significant difference in diaphragmatic excursion in the comparison of the post intervention values of both techniques	The diaphragmatic stretch technique and manual diaphragm release technique can be safely recommended for patients with clinically stable COPD to improve diaphragmatic excursion.
Sebastian B et al., 2024 [21]	Single-Blind	Control group and experimental group (Asthma)	FEV1 FVC 6MWD	Three weeks	The experimental group (Group-B) received Manual diaphragm release technique along with conventional physiotherapy treatment and the control group (Group-A) received conventional physical therapy including, Relaxation	The result of the present study demonstrated that both group showed significant improvement in vital capacity and exercise tolerance. But the experimental group who received manual diaphragm release technique had more significant level of improvement	The present study proves that manual diaphragm release technique when given as an adjunct to conventional treatment is effective in improving vital capacity and exercise tolerance in chronic asthma patients
El Deen MM et al., 2020[22]	Single-Blind	control group and experimental group (Asthma)	FEV1, maximum inspiratory pressure PEFR Diaphragmatic excursion (RT,LT)	Three weeks	Group I received soft-tissue manipulation of the upper cervical region (C0-1), upper dorsal region (T3-4), and thoracolumbar junction followed by muscle energy once weekly for 3 weeks	The mean values of FEV1, maximum inspiratory pressure PEF, and diaphragmatic excursion (RT,LT) were significantly (p	These findings suggested that soft-tissue manipulation is more effective than traditional physiotherapy program on the diaphragmatic excursion and lung function in mild asthmatic patients

Engel RM et al., 2024 [23]	Cohort	Exercise only (Ex) or MT plus exercise (MT+Ex). (COPD)	FVC FEV1 6MWT SGRQ HADS	48 weeks	It consisted of soft-tissue therapy and thoracic SM administered 2 times/wk over a 4-wk period. The ST component involved gentle effleurage and cross-fiber friction therapy applied to the muscles of the posterior chest wall	Although there was no difference in the mean effect over time between groups for lung function (FEV1,P= .97; FVC,P=.98), exercise capacity (6MWT, P =.98),and QoL (SGRQ,P=.41;HADS anxiety, P=.52;and HADS depression, P= 0.06)	While adding MT to Ex did not produce any additional benefits, exercise e alone did deliver sustained modest improvement s in exercise capacity and QoL in mild COPD

[Table/Fig-3]: Showing characteristics of included studies [14-23].
FEV1/FVC+: Forced expiratory volume in 1 second/Forced vital capacity ratio; SGRQ++: St. George's respiratory questionnaire; CAT+++: COPD assessment test; MIP$: Maximum inspiratory pressure

therapeutic strengthening exercises for the shoulder depressors and scapular adductors [14,15]. Park J et al., reported significant improvements in FEV_1 and FVC following the application of Chuna manual therapy over eight weeks [17]. López-de-Uralde-Villanueva I et al., documented significant improvements in FEV_1 and FVC after applying joint mobilisation techniques (Grades III and IV), along with a manipulation technique, for six weeks in patients with asthma [19]. Sebastian B et al., also reported significant improvements in FEV_1 and FVC following the implementation of a manual diaphragm release technique combined with conventional physiotherapy over a three-week period [21].

DISCUSSION

The present scoping review evaluated the current evidence regarding the effectiveness of MT interventions targeting the musculoskeletal system in individuals with OAD. Analysis of the 10 included RCTs and non-RCTs revealed substantial heterogeneity in study designs, participant characteristics, MT protocols, and outcome measures.

The MT encompasses a broad range of techniques that rely on both therapist-administered and patient-assisted interventions. The studies included in this review employed diverse approaches, ranging from spinal manipulative therapy and massage to muscle stretching [14-23]. Although these interventions are all classified under MT, their intended therapeutic mechanisms and physiological effects differ considerably. In many studies, the rationale for selecting specific MT techniques was not clearly supported by robust theoretical or empirical evidence. Instead, several authors justified their interventions based on anecdotal experience or the theoretical assumption that enhancing flexibility of thoracic joints and muscles may improve lung function and reduce the work of breathing [24,25].

The dosage and frequency of MT interventions varied widely, ranging from a single treatment session to multiple sessions over several weeks, with the latter more closely reflecting real-world clinical practice. Similarly, some studies employed a single MT technique [17,18,20,21], whereas others incorporated multiple techniques as part of a comprehensive treatment program [14-16,19,22,23]. Interventions were delivered by a variety of healthcare professionals, including osteopaths, chiropractors, massage therapists, and physiotherapists. Although all these professionals utilise MT, each discipline typically favours specific techniques and possesses varying levels of expertise.

RCTs reported improvements in lung function-specifically increases in FEV_1 and FVC, along with reductions in Residual Volume (RV)-as well as enhanced exercise capacity, demonstrated by increased distances in the 6-Minute Walk Test (6MWT), following combined interventions of Spinal Manipulative Therapy (SMT) and exercise [14,15,17,18,21,23]. The observed reduction in RV and increase in FVC associated with SMT may help explain a delay in the onset of exercise-induced dyspnea. This delay is a plausible explanation for improved exercise performance, as dyspnea is a primary factor limiting physical activity in individuals with OAD.

The MT techniques, such as SMT, soft-tissue mobilisation, and thoracic stretching, aim to improve thoracic spine mobility and reduce muscular and fascial stiffness of the chest wall and upper back. In COPD, hyperinflation and chronic postural alterations contribute to chest wall rigidity, which restricts lung expansion and elastic recoil. By enhancing chest wall mobility and respiratory mechanics, MT may facilitate more complete exhalation, thereby reducing air trapping and lung hyperinflation-hallmark features of COPD that contribute to reduced FVC [26-28].

In addition, MT may stimulate proprioceptive input and neuromuscular activation, leading to improved coordination and recruitment of both primary and accessory respiratory muscles. Techniques such as soft-tissue release and myofascial therapy reduce tension and overactivity in muscles such as the scalenes and sternocleidomastoids, thereby decreasing respiratory workload and fatigue. Improved local circulation resulting from manual interventions may further enhance oxygen delivery to respiratory muscles, supporting their endurance and recovery [29].

The findings of this review are consistent with those reported in a similar review by Simonelli C et al., which examined the effects of MT in patients with COPD. Their analysis demonstrated comparable improvements in lung function, indicated by increases in FEV_1 and FVC, as well as enhanced functional capacity measured by the 6-Minute Walk Test Distance (6MWTD) [29]. Similarly, the results align with those of Heneghan NR et al., who evaluated the effectiveness of MT in COPD patients and reported positive outcomes in both pulmonary function parameters and disease-specific measures, further supporting the role of MT as a beneficial adjunct in COPD management [8].

Clinically, MT techniques are often considered adjuncts to pulmonary rehabilitation; however, heterogeneity among interventions and the absence of clear superiority between modalities make it challenging to identify an optimal approach. Practical considerations also arise, as MT is time and labour-intensive, requires close therapist involvement, and may impose additional burden and costs on patients already participating in comprehensive rehabilitation programs. Although single-session interventions may yield temporary improvements in symptoms or respiratory mechanics, the durability and long-term benefits remain unclear, as follow-up periods in most studies rarely exceed six months.

Limitation(s)

As the present study was a scoping review, only a qualitative assessment of the included studies was performed, and a meta-analysis was not conducted. Another limitation is that MT interventions were delivered by various professionals with differing educational backgrounds and levels of experience, which may have influenced treatment outcomes.

CONCLUSION(S)

Based on the analysis of the included studies, it can be concluded that MT techniques may improve quality of life, lung function, exercise capacity, and respiratory symptoms, while potentially reducing adverse events. MT can therefore be considered an additional therapeutic resource in the management of patients with OADs.

Acknowledgement

Artificial intelligence tools (ChatGPT and QuillBot) were used to assist with language editing and rewording portions of the manuscript. No AI tools were used for data analysis or interpretation. The authors take full responsibility for the integrity, originality, and accuracy of the content.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Aug 01, 2025
- Manual Googling: Nov 25, 2025
- iThenticate Software: Nov 27, 2025 (4%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? No
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jul 31, 2025**
Date of Peer Review: **Aug 12, 2025**
Date of Acceptance: **Nov 29, 2025**
Date of Publishing: **May 01, 2026**