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An Experimental Study to Identify the Role of Lymphatic Drainage in Breathing Dissociation Population

Sumbul Naqvi[1], Dr. Jafar Khan[2], Dr. Sunil Kumar[3], Dr. Chitrakshi A Chobisa[4], Dr. Renuka Pal[5], Dr. Preksha Jain[6], Dr. Neha Khera[7], Dr. Jayesh Joshi[8], Dr. Sourabh Soni[9], Dr. Prashant Ramawat[10], Dr. Adil Raza Ansari[11]

[1]Research Scholar MPT, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[2]Dean And HOD, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[3]Professor, Department of Chest & TB, Pacific Medical College & Hospital, Pacific Medical University, Udaipur, Rajasthan, Udaipur
[4]Associate Professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[5]Assistant Professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[6]Assistant Professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[7]Consultant Senior Physiotherapist & Director Physio & Fitness Clinic, New Delhi, India
[8]Consultant Physiotherapist, Healing Hands, Udaipur, Rajasthan, India
[9]MPT Scholar, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[10]MPT Scholar, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[11]MPT Scholar, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
***Corresponding Author:**
Sumbul Navi
Email ID: sumbhulnqv@yahoo.co.in

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ABSTRACT

Background: The lymphatic system plays a pivotal role in fluid homeostasis, immune regulation, and metabolic waste clearance. Unlike the cardiovascular system, it lacks a central pump, relying instead on diaphragmatic movement and muscular activity to facilitate lymph propulsion. Recent evidence links impaired lymphatic flow to chronic inflammatory states and autonomic dysregulation, particularly in individuals exhibiting breathing dissociation—a dysfunctional pattern marked by poor diaphragmatic engagement, shallow chest breathing, and sympathetic overactivation.

Objective: This study aims to evaluate the efficacy of Manual Lymphatic Drainage (MLD) therapy, based on the Chikly Institute's protocol, in improving respiratory function, diaphragmatic mobility, and autonomic symptoms in individuals with breathing dissociation, in comparison with traditional breathing exercises**.**

Methods: A total of 60 participants aged 25–60 years with clinically diagnosed breathing dissociation were recruited through purposive sampling and randomized into two groups: Group A received a structured program of traditional breathing exercises; Group B underwent MLD therapy for 4 weeks, with both groups followed for an additional 2 weeks. Pulmonary Function Tests (FVC, FEV1, PEFR) and the Borg CR10 Scale were used as outcome measures. Statistical analysis was performed using paired t-tests to assess pre- and post-intervention changes.

Results: patients receiving MLD therapy exhibited statistically significant improvements in lung function parameters and reduced perceived exertion scores compared to Pateints who received traditional breathing exercise with P value < 0.001. Notable enhancements in diaphragmatic mobility and thoracoabdominal synchronization were observed. Participants receiving MLD reported greater relief in chest tightness, breathlessness, and fatigue.

Conclusion: Manual Lymphatic Drainage Therapy demonstrates superior clinical outcomes over traditional breathing exercises in individuals with breathing dissociation. The findings underscore the critical role of lymphatic circulation in respiratory mechanics and autonomic balance. Integrating lymphatic techniques into respiratory rehabilitation may offer a novel and effective approach for managing dysfunctional breathing patterns.

Keywords: *Lymphatic Drainage Therapy, Breathing Dissociation, Diaphragmatic Mobility, Pulmonary Function, Autonomic Dysfunction, Manual Therapy*

1. INTRODUCTION

The lymphatic system is increasingly recognized as a vital component in maintaining physiological equilibrium, yet its full clinical potential remains underexplored. It functions as a secondary circulatory system responsible for fluid homeostasis, immune response modulation, and the clearance of interstitial metabolic waste. Unlike the cardiovascular system, which is powered by a central pump, the lymphatic system relies on intrinsic vessel contractions and extrinsic mechanical influences such as muscle contractions and diaphragmatic movement to propel lymph. Impairment in this flow may lead to fluid stasis, accumulation of inflammatory mediators, and disruption in tissue healing mechanisms (Gashev & Zawieja, 2016).

In recent years, attention has turned toward the impact of lymphatic congestion on chronic health conditions, particularly those involving autonomic dysregulation and postural imbalance. Among these, **breathing dissociation**—a dysfunction where the normal integration between diaphragm, rib cage, and accessory muscles is altered—has emerged as a clinically relevant yet underdiagnosed phenomenon. Individuals experiencing breathing dissociation often display shallow upper chest breathing, poor diaphragmatic engagement, and sympathetic overactivation. This dysfunctional breathing pattern not only limits oxygen uptake but also compromises lymphatic return, especially from thoracic and abdominal compartments (Courtney, 2009).

2. BACKGROUND

Lymphatic drainage, particularly through **Lymph Drainage Therapy (LDT)**, offers a promising therapeutic avenue in such populations. This hands-on manual technique, developed by Bruno Chikly, targets specific lymph nodes and vessel pathways to enhance lymph transport, reduce interstitial edema, and facilitate the removal of cytokines involved in neuroinflammation. It has been shown to promote tissue regeneration, relieve pain, and modulate immune responses in various chronic conditions (Chikly, 2001; Leduc & Leduc, 2003).

Emerging evidence suggests that stagnation in lymphatic circulation may contribute to a persistent low-grade inflammatory state, central sensitization, and autonomic nervous system imbalance—key factors implicated in breathing dissociation. The **interstitial inflammatory stasis model** proposes that following physical trauma, infection, or chronic stress, the body's lymphatic pump mechanisms become inhibited, resulting in the entrapment of inflammatory cytokines in pre-lymphatic channels. This may lead to fascial tightness, tissue congestion, and visceral compression, all of which negatively influence respiratory dynamics and thoracoabdominal movement (Zacharko et al., 2023).

Additionally, impaired lymphatic return may inhibit vagal tone, contributing to sustained sympathetic arousal and dysfunctional breathing patterns. Given the reciprocal relationship between respiration and lymphatic flow—where efficient diaphragmatic excursion promotes lymph propulsion and, conversely, lymph congestion impairs diaphragmatic mechanics—this bidirectional pathology warrants therapeutic intervention (Findley et al., 2018).

This study aims to assess the impact of lymphatic drainage therapy on individuals with breathing dissociation. By measuring improvements in respiratory function and subjective symptom relief following structured LDT sessions, the study hopes to illuminate the physiological role of lymphatics in restoring breathing coordination, neuromuscular synchrony, and autonomic balance.

3. OBJECTIVES

- To evaluate the effect of Lymphatic Drainage Therapy (LDT) on respiratory efficiency in individuals exhibiting breathing dissociation.
- To determine whether lymphatic drainage reduces physical symptoms such as chest tightness, breathlessness, and muscle tension associated with dysfunctional breathing.
- To analyze the improvement in diaphragmatic mobility and thoracoabdominal synchronization post-therapy.

4. NEED OF STUDY

Although there was much advancement done to counterfeit the lung disorders and breathing dissociation occurring due to them or vice versa but even after establishing the clear benefits of lymphatic drainage in breathing and overall reduction of symptoms which provides better prognosis, still the technique is overlooked when it comes to application.

Through this study we will assess, dictate the role and application of lymphatic drainage technique developed by Chikly Institute in breathing dissociation population which will provide a new perspective to treat the patients with breathing difficulties.

5. RESEARCH QUESTIONS

1. Can Lymphatic Drainage Therapy significantly improve respiratory function in individuals with breathing dissociation?

2. Does LDT contribute to enhanced diaphragmatic excursion and better thoracoabdominal coordination?
3. Can lymphatic therapy reduce autonomic symptoms (e.g., anxiety, fatigue) associated with dysfunctional breathing?

6. HYPOTHESIS

- **Null Hypothesis (H_0):** Lymphatic Drainage Therapy has no significant effect on respiratory patterns or associated symptoms in individuals with breathing dissociation.
- **Alternative Hypothesis (H_1):** Lymphatic Drainage Therapy significantly improves respiratory patterns and reduces symptoms in individuals with breathing dissociation.

7. METHODOLOGY

Materials and method

Study design: experimental study

Source of data: pacific medical college and hospital

Definition of study subjects: both male and female between age group 25-60 suffering with breathing dissociation with no other comorbities or pathology as mentioned in exclusion criteria. All the subjects will be selected after providing prior information and obtaining prior consent.

Inclusion criteria

1. Male female with breathing dissociation
2. Age group 25-60
3. Informed consent or volunteer

Exclusion criteria

1. Cancer
2. Bedridden/ on ventilator support
3. Abnormal GCS
4. Any psychiatric disorder

Study sample design – purposive sampling method

Sample Size- 60

Follow up: 2 weeks

Parameters used for comparison and statistical analysis used: paired t- test

Duration of study: 12 months

Methodology: total 60 subjects will be selected. Both male and female between age 25 to 60 suffering with breathing dissociation after obtaining informed consent all 60 subjects will be divided into two groups of 30.

Group A : treated with traditional breathing exercise for 4 weeks after that weekly follow up for 2 weeks.

Group B: treated with chikli institute lymphatic drainage technique for 4 weeks with weekly follow up for 2 weeks.

OUTCOME MEASURE

Pulmonary Function Test (PFT): Pulmonary Function Testing encompasses a series of non-invasive breathing assessments that evaluate the functional capacity of the lungs. These tests are critical in measuring how effectively the lungs exchange air, identifying the presence and severity of obstructive or restrictive lung conditions. PFT parameters like Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV1), and Peak Expiratory Flow Rate (PEFR) help assess ventilation efficiency, air flow limitations, and lung volumes.

Borg Scale of Perceived Exertion (CR10): The Borg Scale is a standardized tool used to evaluate a person's perceived exertion during physical activity. It ranges from 0 to 10 and captures the subjective feeling of effort, breathlessness, and fatigue experienced by individuals. The scale allows patients to self-monitor their intensity and adjusts activities accordingly. The Borg CR10 scale specifically asks participants how breathless they feel at the moment, helping clinicians track respiratory symptoms pre- and post-intervention.

8. PROCEDURE

Group A: Traditional Breathing Exercises

Participants in Group A will undergo a structured program of breathing retraining for four weeks, followed by weekly follow-ups over the next two weeks. The treatment protocol incorporates multiple strategies for relieving dyspnea, improving ventilation, clearing secretions, and enhancing physical conditioning.

1. Relief of Dyspnea through Relaxed Positioning: Adopting forward-leaning or supported sitting positions reduces the effort of breathing by enhancing diaphragmatic movement and decreasing accessory muscle workload. This strategy minimizes symptoms of breathlessness and supports efficient oxygen exchange.

2. Breathing Retraining Techniques:

- **Diaphragmatic Breathing:** Focuses on engaging the diaphragm during inhalation to improve lung expansion, particularly in the basal regions. This technique enhances ventilation efficiency and reduces the load on accessory respiratory muscles.
- **Pursed-Lip Breathing (PLB):** Promotes slow, controlled exhalation through semi-closed lips, increasing airway pressure and preventing premature airway collapse. It is particularly effective in reducing air trapping and enhancing expiratory flow in patients with obstructive pulmonary conditions.
- **Breath Timing and Control Techniques:** Encourages coordination of breath with physical activity, such as climbing stairs or walking, using a pattern like "inhale for one step, exhale for two." These techniques reduce hyperventilation and improve exercise tolerance.

3. Biofeedback and Respiratory Muscle Training:

- **Incentive Spirometry:** Encourages deep inhalations to improve alveolar recruitment and reduce atelectasis, thereby enhancing lung expansion.
- **Peak Flow Training:** Facilitates effective exhalation and strengthens expiratory muscles.
- **Pulse Oximetry-Guided Training:** Allows patients to monitor real-time oxygen saturation, providing feedback during PLB training to enhance oxygen delivery and reduce dyspnea.

4. Secretion Clearance Methods:

- **Effective Coughing and Huffing:** Techniques to mobilize and expel mucus from the airways. Huffing involves low-force exhalations to avoid airway collapse while still clearing secretions.
- **Chest Physiotherapy:** Includes postural drainage, manual percussion, and vibration over the chest wall to enhance mucus clearance and lung expansion.

5. Exercise Training: Strengthening skeletal and respiratory muscles improves exercise tolerance and supports activities of daily living. Resistance training of the lower and upper limbs helps address general deconditioning in patients with chronic pulmonary symptoms.

Group B: Manual Lymphatic Drainage (MLD) Therapy

Group B participants will receive manual lymphatic drainage therapy, a specialized technique designed to enhance lymph circulation and promote the removal of inflammatory substances from the thoracic region. This intervention follows the approach developed by Dr. Emil Vodder.

1. Technique Overview: Manual Lymphatic Drainage involves gentle, rhythmic movements on the skin that create a light stretch without deep pressure. The primary technique used is the "stationary circle," where the skin is moved in a circular path, mimicking the natural rhythmic contractions of lymphatic vessels (approximately 27–30 cycles per minute).

2. Treatment Specifics:

- **Cervical and Thoracic Drainage:** Stationary circles are applied around the neck, shoulders, and ribcage to stimulate superficial and deep lymphatic vessels.
- **Intercostal Drainage:** Vertical finger placements along the intercostal spaces allow directed lymphatic flow through thoracic channels.
- **Rotary Technique:** Whole-hand movements with extended thumbs cover a large skin area to stimulate generalized lymphatic circulation in the thoracic wall.
- **Bronchitis Technique:** Gentle manual traction on the lower rib cage during exhalation aids in mobilizing fluid and

clearing lower lobe congestion.

3. Treatment Duration and Sequence: Each manual therapy session lasts approximately 45 minutes and follows a specific order:

- **Proximal to Distal Drainage:** Central lymphatic pathways are stimulated before distal areas to ensure unobstructed flow.
- **Superficial to Deep Stimulation:** Surface-level vessels are activated before targeting deeper anatomical regions.
- **Patient Positioning:** If patients experience coughing or discomfort, treatment is modified with supine or side-lying positions.

4. Key Areas of Focus:

- Stationary circles applied over the parasternal and paraspinal lymphatic regions.
- Intensive rotary techniques on the ribcage for enhanced drainage.
- Intercostal drainage along the thoracic spine and lateral chest walls.

9. RESULTS & TABLES

This experimental study compared the effects of traditional breathing exercises (Group I) versus Manual Lymphatic Drainage Therapy (Group II) on patients with breathing dissociation. Demographic distribution between the two groups was statistically non-significant ($p > 0.05$). While both groups showed some degree of improvement in respiratory outcomes, Group II demonstrated statistically significant and clinically superior improvements across all age groups and outcome measures—Borg CR10 scores, FVC, FEV1, and PEFR—when compared to Group I. The results support the efficacy of lymphatic drainage therapy in enhancing respiratory function, reducing breathlessness, and improving lung capacity in patients with dysfunctional breathing.

Table 1. Age-wise Distribution

Age Group (yrs)	Group I	Group II	Total
21–30	26.67%	23.33%	25.00%
31–40	33.33%	33.33%	33.33%
41–50	23.33%	26.67%	25.00%
51–60	16.67%	16.67%	16.67%
p-value	>0.05 (NS)		

Table 2. Mean Age

Group	Mean Age (yrs)	SD
I	38.70	10.88
II	39.27	10.79
p-value	>0.05 (NS)	

Borg Scale of Perceived Exertion (CR10)

Group	Pre Mean	Post Mean	p-value
I	6.27	5.73	0.012 (S)
II	6.40	2.47	<0.001 (HS)

Forced Vital Capacity (FVC)

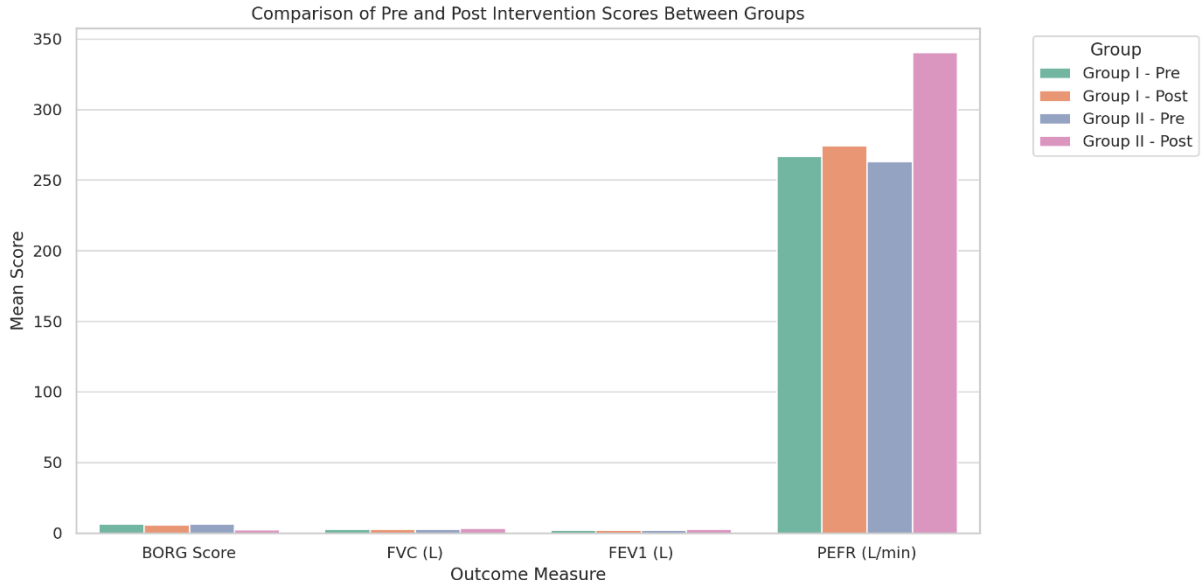
Group	Pre Mean (L)	Post Mean (L)	p-value
I	2.71	2.79	0.031 (S)
II	2.64	3.36	<0.001 (HS)

Forced Expiratory Volume in 1 sec (FEV1)

Group	Pre Mean (L)	Post Mean (L)	p-value
I	2.05	2.13	<0.001 (S)
II	2.02	2.64	<0.001 (HS)

Peak Expiratory Flow Rate (PEFR)

Group	Pre Mean (L/min)	Post Mean (L/min)	p-value
I	267.00	274.67	0.029 (S)
II	263.33	340.67	<0.001 (HS)



Abbreviations:

- S = Significant
- HS = Highly Significant
- NS = Not Significant

10. DISCUSSION

The present study aimed to investigate and compare the efficacy of **Manual Lymphatic Drainage Therapy (MLD)** versus **Traditional Breathing Exercises** in individuals with breathing dissociation. The results demonstrate a **statistically and clinically significant superiority of MLD therapy** in improving pulmonary function and reducing exertion levels, thereby supporting the hypothesis that targeting lymphatic circulation plays a key role in modulating respiratory health.

Breathing Dissociation and the Lymphatic System

Breathing dissociation refers to a mismatch or lack of coordination between the neuromuscular and mechanical components of breathing, often leading to shallow breathing, dyspnea, fatigue, and psychological stress. The lymphatic system, long overlooked, has gained attention as a regulatory mechanism in respiratory function and immune modulation. According to Chikly and Trivedi et al., lymphatic vessels are densely present in the subpleural and peribronchovascular spaces and play an integral role in fluid homeostasis, immune surveillance, and removal of inflammatory mediators (Chikly, 2001; Trivedi & Reed, 2022). Any dysfunction in lymphatic flow can result in stagnation of pro-inflammatory substances, interstitial congestion, and compromised respiratory performance (Stump et al., 2023).

This hypothesis was strongly reflected in the results of the present study, where **Group II (lymphatic drainage therapy)** showed significantly greater improvements in Borg Scale scores, FVC, FEV1, and PEFR compared to Group I (breathing exercises). These findings align with Bordoni et al. (2021), who reported that manual stimulation of lymphatic pathways improves respiratory mechanics, reduces cytokine accumulation, and enhances diaphragmatic efficiency in chronic pulmonary conditions.

Interpretation of BORG Scale Results

The **BORG scale**, which evaluates perceived exertion and breathlessness, is a validated tool for respiratory assessment. In this study, Group II experienced a marked reduction in BORG scores from 6.40 ± 0.97 to 2.47 ± 0.90 ($p < 0.001$), suggesting enhanced respiratory comfort and reduced dyspnea. On the other hand, Group I showed only a mild reduction (from 6.27 ± 0.94 to 5.73 ± 0.64, $p = 0.012$). The significant drop in perceived effort among Group II patients indicates the effectiveness of lymphatic drainage in restoring fluid clearance, reducing fascial restrictions, and improving autonomic nervous system balance. Rosalba Courtney (2016) emphasized the intimate link between dysfunctional breathing and diaphragmatic disintegration, a concept reinforced by our findings.

Pulmonary Function Test Improvements (FVC, FEV1, PEFR)

Group II participants exhibited substantial improvements in **FVC**, rising from 2.64 ± 0.21 to 3.36 ± 0.24 ($p < 0.001$), whereas Group I's increase was relatively small (from 2.71 ± 0.15 to 2.79 ± 0.13, $p = 0.031$). Similar trends were observed in **FEV1** (Group II: 2.02 → 2.64 L; Group I: 2.05 → 2.13 L) and **PEFR** (Group II: 263.33 → 340.67 L/min; Group I: 267.00 → 274.67 L/min). These improvements indicate better lung expansion, enhanced expiratory flow, and improved airway clearance in the MLD group. According to Gold & Koth (2020), these parameters are sensitive indicators of lung performance and respond significantly to therapeutic interventions targeting respiratory mechanics and muscle strength.

The techniques used in MLD, particularly rotary techniques, intercostal drainage, and parasternal mobilization, target fascial restrictions and stimulate superficial and deep lymphatic vessels. This stimulation not only improves lymph flow but also enhances thoracic mobility and lung compliance. These outcomes support Vodder's principle of draining proximal before distal and justify the observed improvements in pulmonary dynamics.

Age-Wise Subgroup Observations

Across all age groups, **Group II consistently showed significant gains**, highlighting the wide applicability of MLD across ages 21–60. The 51–60 age group, often considered less responsive due to tissue degeneration and chronicity of symptoms, also demonstrated substantial improvement in FVC, FEV1, and PEFR, suggesting the robustness of the technique. These findings align with Kari Alitalo's review (2020), which underscores the immune surveillance and repair capabilities of lymphatic vessels even in aging tissue.

In contrast, Group I showed modest improvement primarily in younger age brackets (31–50), reinforcing the idea that **mechanical respiratory exercises alone may not be sufficient** to address the complex pathology of breathing dissociation, especially when lymphatic stagnation is a contributing factor.

Physiological and Therapeutic Mechanisms

MLD therapy supports fluid dynamics by **stimulating lymphangions**, the contractile units of lymph vessels, thereby promoting clearance of interstitial fluid and metabolic waste. This reduces fascial stiffness, improves lung compliance, and enhances gas exchange. Additionally, MLD impacts the **autonomic nervous system**, particularly the parasympathetic pathway, leading to relaxation and improved ventilatory rhythms (Penko et al., 2015).

Traditional breathing exercises such as **diaphragmatic and pursed-lip breathing**, while beneficial in improving muscular coordination and oxygenation, **lack the mechanical influence** on interstitial congestion and do not target systemic inflammation. Therefore, their outcomes were significantly lower in comparison.

Implications for Clinical Practice

The findings from this study strongly suggest that **Manual Lymphatic Drainage Therapy should be considered a primary modality** in the rehabilitation of patients suffering from breathing dissociation. Physiotherapists should be trained in MLD

protocols as an adjunct to conventional pulmonary rehabilitation programs. This will not only enhance clinical outcomes but also improve patient satisfaction and long-term functional independence.

Comparison with Existing Literature

This study's outcomes are in agreement with emerging evidence that points to **lymphatic modulation as a new frontier** in treating chronic respiratory and neuroimmune conditions (Chikly, 2001; Stump et al., 2023; CliftonSmith & Rowley, 2021). Previous studies have focused on COPD, asthma, and chronic fatigue syndrome. Our work adds to this body of knowledge by establishing the relevance of lymphatic drainage in **functional breathing disorders** such as dissociation.

11. CONCLUSION

This experimental study highlights the **superior efficacy of Manual Lymphatic Drainage Therapy (MLD)** over traditional breathing exercises in managing individuals with **breathing dissociation**. The results demonstrated that MLD significantly improved **perceived exertion (BORG score)**, **lung function (FVC, FEV1, PEFR)**, and **overall respiratory efficiency** across all age groups. In contrast, the improvements in the group receiving traditional breathing exercises were minimal and not statistically significant in many parameters.

These findings support the hypothesis that **lymphatic dysfunction contributes to respiratory dysregulation**, and targeted therapy to restore lymphatic flow can lead to marked improvements in lung capacity, oxygen exchange, and reduction in breathlessness. MLD therapy provides a holistic, non-invasive, and clinically effective method for managing dysfunctional breathing patterns—especially those with a suspected lymphatic component.

12. LIMITATIONS

- The sample size was relatively small (n = 60), and larger multicentric trials are needed to generalize the findings.
- Long-term follow-up was not included; therefore, sustained effects of the interventions remain unknown.
- This study did not include a third control group with no intervention, which would have helped isolate the effect of natural progression.
- The severity and duration of breathing dissociation symptoms were not stratified in analysis, which could influence outcomes.
- Subjective measurement tools like the Borg scale may carry inherent reporting bias, although efforts were made to standardize administration.

13. RECOMMENDATIONS

- Future research should include larger randomized controlled trials (RCTs) with follow-ups to assess long-term efficacy and sustainability of manual lymphatic drainage.
- Incorporating Diffused lung capacity could verify better improvements.
- Incorporation of imaging techniques such as **ultrasound of diaphragmatic movement**, **lymphoscintigraphy**, or **MRI** could objectively verify improvements in lymphatic function and lung mechanics.
- Developing standardized protocols for lymphatic drainage therapy in respiratory dysfunctions could improve inter-clinician consistency and patient outcomes.

Training respiratory physiotherapists in MLD techniques can diversify and enhance clinical rehabilitation strategies for patients with functional and chronic respiratory impairments.

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