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COMPARATIVE EFFECTS OF DIAPHRAGMATIC MYOFASCIAL RELEASE VERSUS DIAPHRAGMATIC BREATHING IN POST-OPERATIVE PATIENTS DIAGNOSED WITH GASTRO ESOPHAGEAL REFLUX DISEASE (GERD)

Original Research

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ABSTRACT

Background: Gastroesophageal reflux disease (GERD) is a chronic condition characterized by the backflow of gastric contents into the esophagus, leading to symptoms such as heartburn and regurgitation. It significantly affects patients' quality of life by causing persistent discomfort and complications. Effective management of GERD is essential, especially for postoperative patients who often face exacerbated symptoms. Non-pharmacological interventions such as diaphragmatic breathing exercises and diaphragmatic myofascial release have shown potential in symptom reduction and quality-of-life improvement.

Objective: To compare the effects of diaphragmatic breathing exercises and diaphragmatic myofascial release on GERD symptom severity and quality of life in postoperative patients diagnosed with GERD.

Methods: A randomized clinical trial was conducted with a sample of 28 postoperative GERD patients. Participants were allocated to two groups using the lottery method. Group A (n=14) received diaphragmatic myofascial release, while Group B (n=14) received diaphragmatic breathing exercises. Interventions were delivered twice weekly for two weeks. The primary outcome was GERD severity, measured using the Reflux Disease Questionnaire (RDQ), and the secondary outcome was symptom severity, assessed with the Gastrointestinal Symptom Rating Scale (GSRS). Data were collected at baseline and post-treatment. Statistical analysis included paired and independent t-tests, with a significance level of $p<0.05$.

Results: Group A showed a significant reduction in mean RDQ scores from 45.53 ± 4.17 to 35.38 ± 4.48, with a mean difference of 10.15 ± 1.28 ($p=0.001$). Group B exhibited a smaller reduction in RDQ scores, from 44.84 ± 3.64 to 43.00 ± 3.87, with a mean difference of 1.84 ± 1.21 ($p=0.004$). For GSRS, Group A demonstrated a decrease from 67.61 ± 4.89 to 52.00 ± 3.26 (mean difference: 15.61 ± 2.66, $p=0.001$), while Group B reduced from 68.53 ± 3.95 to 65.07 ± 4.01 (mean difference: 3.46 ± 0.77, $p=0.002$). Between-group analysis revealed a significant post-treatment difference for both RDQ and GSRS scores ($p=0.001$).

Conclusion: Diaphragmatic myofascial release is more effective than diaphragmatic breathing exercises in reducing GERD symptoms and improving quality of life in postoperative patients diagnosed with GERD.

Keywords: Diaphragmatic breathing, diaphragmatic myofascial release, gastrointestinal symptoms, gastroesophageal reflux disease, postoperative care, quality of life, symptom management.

INTRODUCTION

Gastroesophageal Reflux Disease (GERD) represents a significant health challenge characterized by the backflow of gastric contents into the esophagus, leading to distressing symptoms that considerably impair quality of life. As a condition with a high prevalence in society, GERD is associated with various physical, emotional, and social repercussions, including persistent pain, reduced physical and social functionality, and compromised emotional well-being (1). Addressing these concerns through effective management strategies is critical to enhancing patients' overall quality of life.

GERD arises from complex interactions involving anatomical and physiological factors. Among the primary causes are transient relaxations of the lower esophageal sphincter (TLESRs), reduced esophageal clearance, delayed gastric emptying, and conditions such as hiatal hernia. Behavioral and dietary patterns, including the timing and acidity of meals, along with lifestyle factors like smoking, obesity, and sedentary habits, are significant contributors to the disease's progression. Psychological factors such as anxiety and depression further exacerbate GERD, illustrating its multifactorial nature (2).

The hallmark symptom of GERD is heartburn, characterized by a burning sensation extending into the esophagus and often accompanied by an unpleasant aftertaste. Beyond these primary symptoms, GERD can manifest as extra-esophageal complications, including chronic throat clearing, laryngeal irritation, and bronchospasm-induced respiratory symptoms such as wheezing, cough, and shortness of breath (3). These manifestations emphasize the diverse and sometimes severe implications of the disease.

Management of GERD typically begins with lifestyle modifications aimed at symptom reduction. Dietary adjustments, including the avoidance of acidic, spicy, and fatty foods, play a crucial role in alleviating symptoms. Despite advances in surgical interventions like antireflux surgery (ARS), the utilization of these approaches has declined, reflecting both evolving patient preferences and clinical perspectives (7). Complementary therapies, including hypnosis and acupuncture, have gained attention as alternative management strategies, aligning with the principles of integrative medicine, which emphasizes a holistic approach encompassing pharmacological treatments, mind-body practices, improved sleep hygiene, and physical activity (8, 10).

Among non-pharmacological approaches, diaphragmatic breathing has emerged as a promising technique for managing GERD symptoms. This method involves guiding patients through controlled breathing exercises that promote diaphragmatic activation, thereby enhancing esophageal sphincter function and reducing reflux episodes. Similarly, myofascial release (MFR) therapy, targeting diaphragmatic myofascial structures, aims to restore diaphragmatic functionality and improve symptomatology in non-erosive GERD (11, 15).

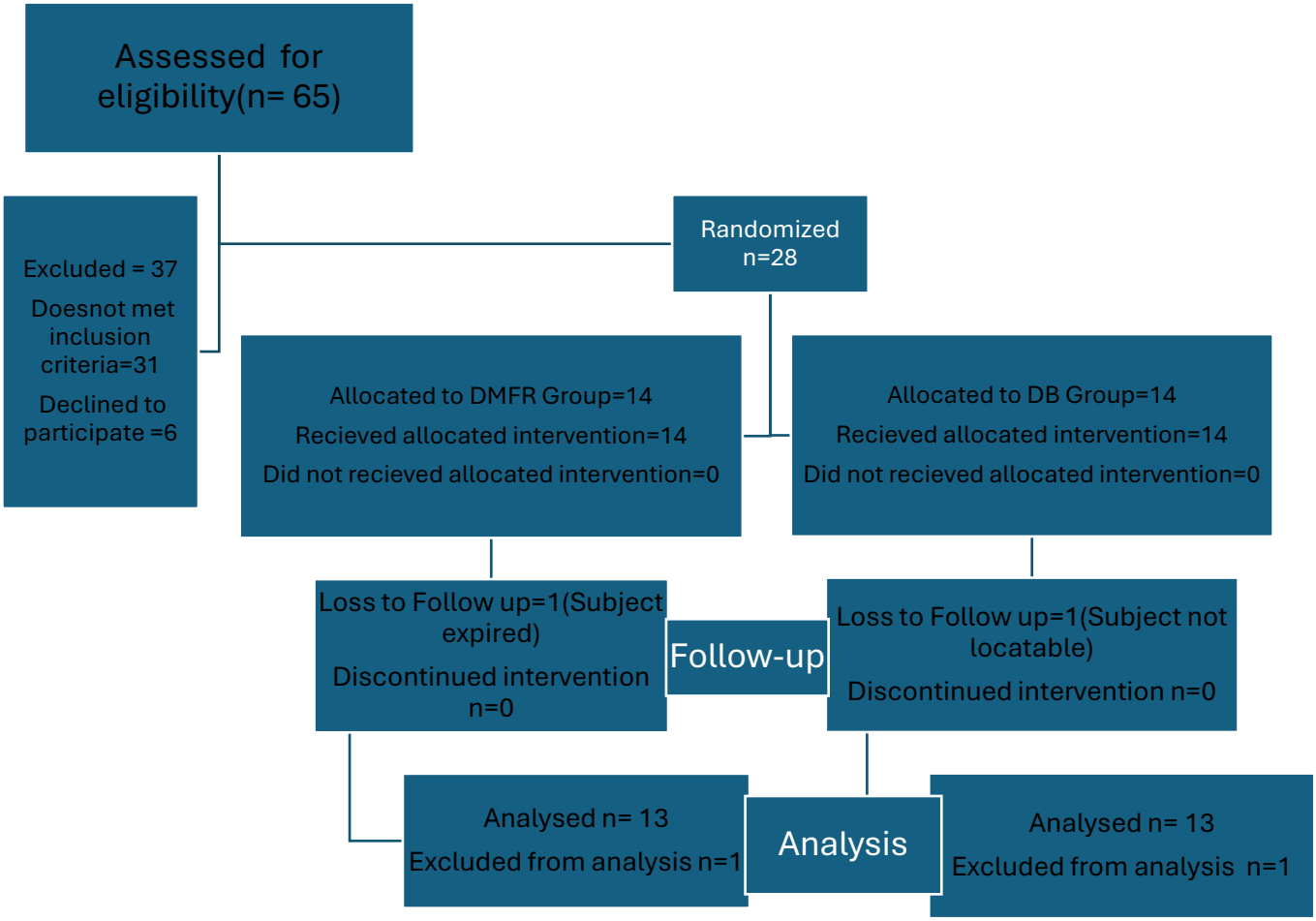
Given the evolving landscape of GERD management, it becomes imperative to explore innovative approaches that address not only symptom control but also patients' dependence on pharmacological agents like proton pump inhibitors (PPIs). This study seeks to comparatively evaluate the effects of diaphragmatic breathing exercises and myofascial release therapy in post-operative GERD patients, aiming to ascertain their efficacy in improving clinical outcomes and enhancing the quality of life. By addressing these objectives, this research aspires to contribute to a more comprehensive understanding of integrative therapeutic modalities in GERD management.

METHODS

This study was designed as a randomized clinical trial conducted over four months at multiple healthcare facilities in Faisalabad, including Madina Teaching Hospital, Aziz Fatima Hospital, Allied Hospital, and District Headquarters Hospital. Participants were selected using a convenience sampling technique, and the sample size was determined as 28 individuals (14 in Group A and 14 in Group B) using the Raosoft sample size calculator. Allocation to Treatment A (diaphragmatic myofascial release) and Treatment B (diaphragmatic breathing exercises) was conducted through a lottery method, ensuring each participant had an equal chance of assignment. The trial was registered with the Iranian Registry of Clinical Trials (IRCT) under Trial ID 78257.

The inclusion criteria encompassed post-operative GERD patients aged 25 to 45 years, of both genders, with a confirmed diagnosis of GERD within one week of surgery, who had not responded adequately to conventional treatments. Participants were required to have

stable cardiovascular and respiratory systems and demonstrate a willingness to participate. Exclusion criteria included individuals with significant comorbidities, serious cardiovascular or respiratory diseases, febrile conditions, recent abdominal or thoracic surgeries, malignancy, psychiatric disorders, osteoporosis, smoking or excessive alcohol intake, pregnancy, dermatological conditions, or concurrent participation in other clinical trials. This exclusion ensured that confounding factors that might influence GERD symptoms or outcomes were minimized.



Registered in Iranian Registry of Clinical Trial (IRCT) under Trial Id 78257.

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Informed consent, both verbal and written, was obtained from all participants before inclusion in the study. Ethical approval was secured from the relevant institutional review board (IRB) to ensure compliance with ethical standards and participant rights. Baseline assessments were conducted using the Reflux Disease Questionnaire (RDQ) and the Gastrointestinal Symptom Rating Scale (GSRS) to collect demographic data, medical history, and initial GERD symptom severity. Participants were then randomly assigned to one of the two intervention groups.

Participants in the diaphragmatic breathing exercise group were instructed to perform the technique in a comfortable supine or sitting position, with hands placed on the abdomen and a pillow supporting the head. The exercises involved deep nasal inhalation followed by exhalation through the mouth, focusing on relaxation. Each session comprised 10 repetitions, conducted twice weekly for two weeks.

The diaphragmatic myofascial release technique was administered with participants in a comfortable supine position. Adequate pressure was applied from the medial to lateral sides, below the costal margins, to target the diaphragm. This intervention also consisted of 10 repetitions, performed twice weekly for two weeks, with follow-up sessions scheduled similarly.

Standardized protocols guided both interventions, and data were collected at multiple time points, including pre-intervention, post-intervention, and follow-up assessments. Outcome measures included GERD symptom scores, quality of life indices, physiological measures, and patient-reported outcomes. The RDQ, a 12-item self-administered questionnaire, evaluated the frequency and severity of heartburn, regurgitation, and dyspeptic complaints in the early weeks post-surgery. Changes in health-related quality of life were assessed using the GSRS. The Shapiro-Wilks test was employed to evaluate data normality, with a significance value above 0.05 indicating normally distributed data.

Comfortable supine position Applying technique to the diaphragm with adequate pressure from medial side to lateral ,below costal margins. 10 repetitions 2 times per week. Follow up sessions for 2 week.

Figure 1 Diaphragmatic Myofascial Release

Figure 2 Diaphragmatic Breathing Exercises

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RESULTS

The results demonstrated significant improvements in the Gastrointestinal Symptoms Rating Scale (GSRS) scores for both intervention groups. Within the diaphragmatic myofascial release group, the mean GSRS score before treatment was 67.61 ± 4.89, which significantly decreased to 52.00 ± 3.26 post-treatment, reflecting a mean difference of 15.61 ± 2.66 (p=0.001). Similarly, the diaphragmatic breathing exercise group exhibited a reduction in GSRS scores, with a baseline mean of 68.53 ± 3.95 and a post-treatment mean of 65.07 ± 4.01, resulting in a mean difference of 3.46 ± 0.77 (p=0.002). Between-group analysis revealed that the baseline GSRS scores were comparable (p=0.396), indicating homogeneity of the population. However, post-treatment, the GSRS scores were significantly lower in the diaphragmatic myofascial release group compared to the diaphragmatic breathing exercise group (p=0.001), highlighting the superior efficacy of myofascial release in reducing gastrointestinal symptoms.

The Reflux Disease Questionnaire (RDQ) analysis further reinforced the findings. Within the diaphragmatic myofascial release group, the RDQ mean score reduced from 45.53 ± 4.17 at baseline to 35.38 ± 4.48 post-treatment, reflecting a significant mean difference of 10.15 ± 1.28 (p=0.001). In the diaphragmatic breathing exercise group, the RDQ mean score decreased from 44.84 ± 3.64 to 43.00 ± 3.87 post-treatment, with a smaller mean difference of 1.84 ± 1.21 (p=0.004). Between-group comparison showed no significant baseline differences in RDQ scores (p=0.963), confirming similar population characteristics. Post-treatment RDQ scores were significantly lower in the diaphragmatic myofascial release group compared to the diaphragmatic breathing exercise group (p=0.001), indicating greater improvement in symptoms with the former intervention. The overall findings suggest that diaphragmatic myofascial release was more effective in improving both GSRS and RDQ scores compared to diaphragmatic breathing exercises. This aligns with the objective of determining the comparative efficacy of these interventions.

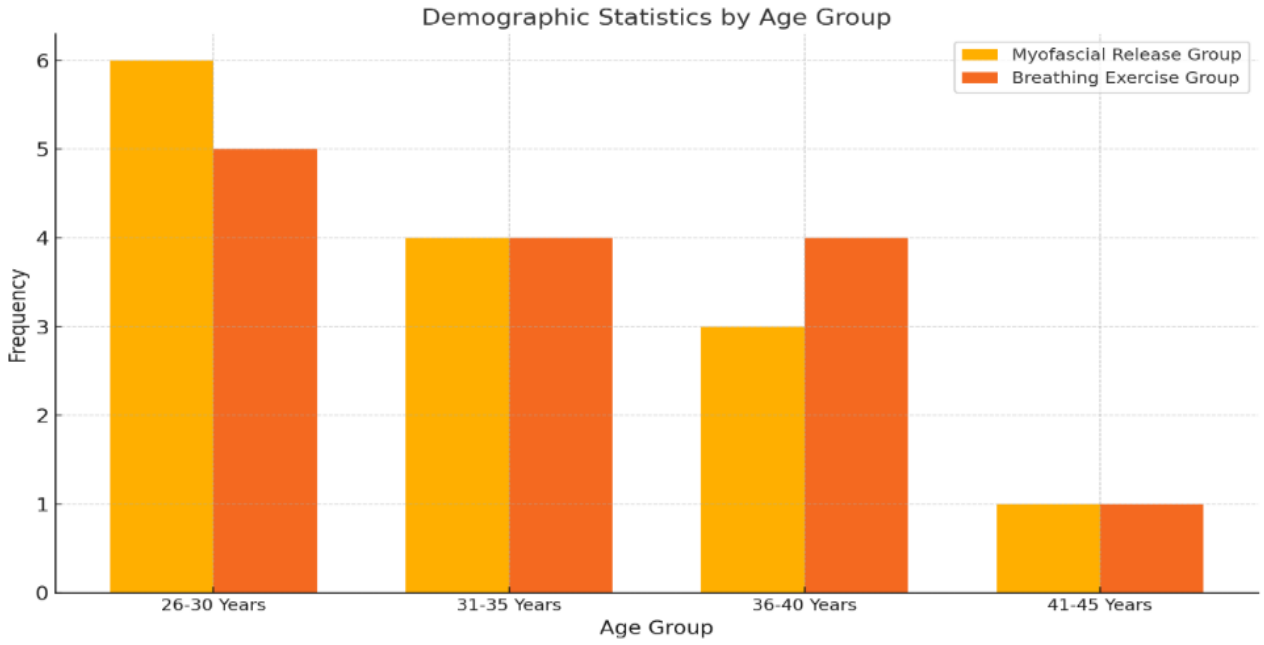

Figure 3 Demographic Statistics by Age Group

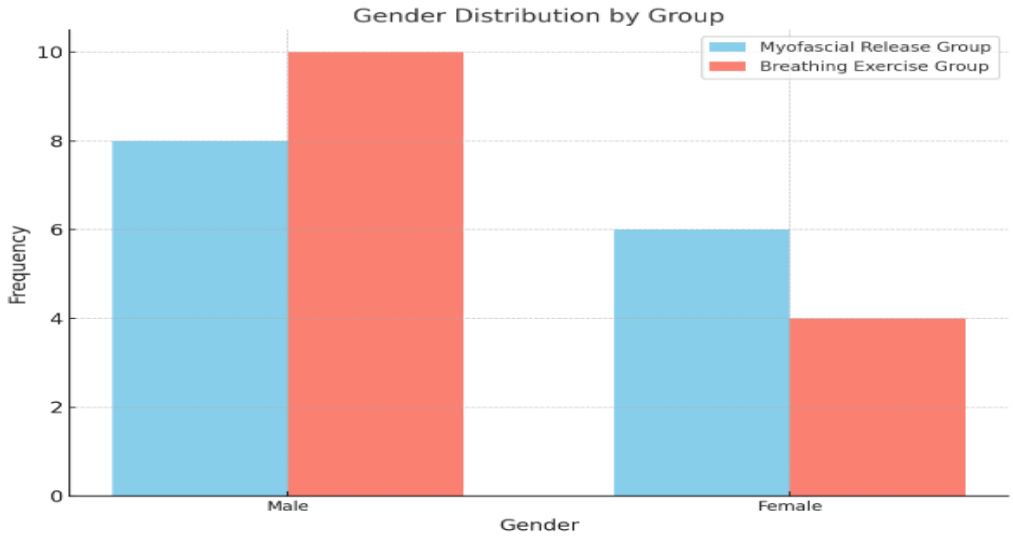

Figure 4 Gender Distribution by Group

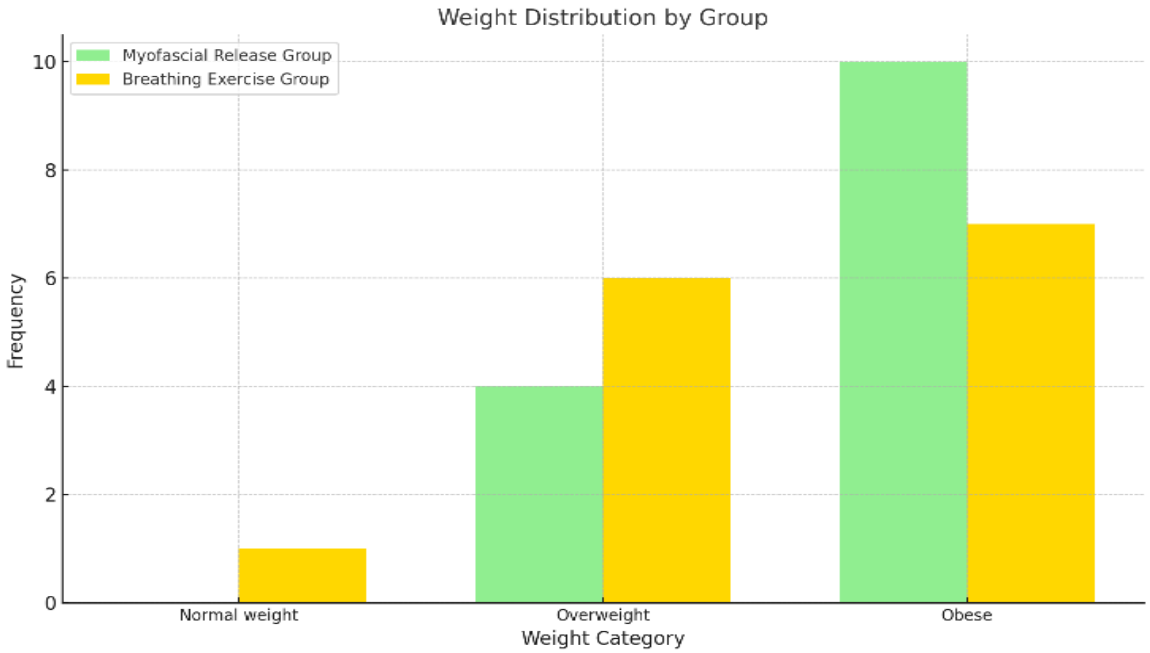

Figure 5 Gastrointestinal symptoms rating scale within Group Analysis

The charts illustrate the demographic characteristics of participants in the study. The first chart shows age distribution, with the 26-30 age group being the largest for both groups (42.9% for Myofascial Release and 35.7% for Breathing Exercises). The second chart highlights gender distribution, where males were more prevalent in both groups (57.1% in Myofascial Release and 71.4% in Breathing Exercises). The third chart displays weight distribution, with obesity being the most common category (71.4% in Myofascial Release and 50% in Breathing Exercises). These visualizations underscore key participant characteristics.

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Table 1 The descriptive statistics and paired sample test statistics are given below.

Groups	Paired Samples Statistics				
		Mean	N	Std. Deviation	Sig
Diaphragmatic Myofascial Release Group	Gastrointestinal Symptoms Rating Scale at Baseline	67.6154	13	4.89112	0.001
	Gastrointestinal Symptoms Rating Scale Post-treatment	52.0000	13	3.26599	
Diaphragmatic Breathing Exercise Group	Gastrointestinal Symptoms Rating Scale at Baseline	68.5385	13	3.95001	0.002
	Gastrointestinal Symptoms Rating Scale Post-treatment	65.0769	13	4.00960	

Table 1: Paired sample t-test statistics GSRS within group analysis

Table 1 given above shows the paired sample test statistics of the GSRS within groups analysis. The data shows that the mean of GSRS within group A before treatment was 67.61 ± 4.89 and after the treatment it was 52.00 ± 3.26 which shows the means difference of 15.61 ± 2.66. The test statistics shows a significance value less than 0.05 (i.e., p= 0.001), which means that diaphragmatic myofascial release technique brought a significant change in the GSRS score of group A participants.

The data shows that the mean of GSRS within group B before treatment was 68.53 ± 3.95 and after the treatment it was 65.07 ± 4.01 which shows the means difference of 3.46 ± 0.77. The test statistics shows a significance value less than 0.05 (i.e., p= 0.002), which means that diaphragmatic breathing exercises brought a significant change in the GSRS score of group B participants.

Table 2 Gastrointestinal symptoms rating scale Between Group A and B Analysis

Group		N	Mean	Std. Deviation	Sig.
Gastrointestinal Symptoms Rating Scale at Baseline	Diaphragmatic Myofascial Release Group	14	67.2857	4.85844	0.396
	Diaphragmatic Breathing Exercise Group	14	68.7143	3.85164	
Gastrointestinal Symptoms Rating Scale Post-treatment	Diaphragmatic Myofascial Release Group	13	52.0000	3.26599	0.001
	Diaphragmatic Breathing Exercise Group	13	65.0769	4.00960	

Table 2 given above shows the independent sample test statistics GSRS between group A and B. The table shows that the baseline values of GSRS were not significant (i.e., p= 0.396) which is above level of significance, means that at baseline there was not significant difference among participants, indicating that the samples of both groups were taken from similar population.

The table above shows that the post-treatment values of GSRS are significant between group A and B and have a significance value below 0.05 (i.e., p=0.001), looking at the descriptive statistics in the paired sample test, it is resulted that the group receiving the diaphragmatic myofascial release treatment had significant improvement as compared to the group of participants receiving the diaphragmatic breathing exercises. It is concluded that diaphragmatic myofascial release technique produced statistically significant results on GSRS as compared to the diaphragmatic breathing exercises.

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Table 3 Paired sample t-test statistics RDQ within group analysis (Reflux disease questionnaire within Group Analysis)

Groups	Paired Samples Statistics	Mean	N	Std. Deviation	Sig
Diaphragmatic Myofascial Release Group	Reflux disease questionnaire at Baseline	45.5385	13	4.17563	0.001
	Reflux disease questionnaire Post-treatment	35.3846	13	4.48216	
Diaphragmatic Breathing Exercise Group	Reflux disease questionnaire at Baseline	44.8462	13	3.64797	0.004
	Reflux disease questionnaire Post-treatment	43.00	13	3.87298	

Table 3 given above shows the paired sample test statistics of the RDQ within groups analysis. The data shows that the mean of RDQ within group A before treatment was 45.53 ± 4.17 and after the treatment it was 35.38 ± 4.48 which shows the means difference of 10.15 ± 1.28. The test statistics shows a significance value less than 0.05 (i.e., p= 0.001), which means that diaphragmatic myofascial release technique brought a significant change in the RDQ score of group A participants.

The data shows that the mean of RDQ within group B before treatment was 44.84 ± 3.64 and after the treatment it was 43.00 ± 3.87 which shows the means difference of 1.8462 ± 1.21. The test statistics shows a significance value less than 0.05 (i.e., p= 0.004), which means that diaphragmatic breathing exercises brought a significant change in the RDQ score of group B participants.

Table 4 Independent samples t-test statistics RDQ between group A and B analysis (Reflux disease questionnaire Between Group A and B Analysis)

	Group	N	Mean	Std. Deviation	Sig.
Reflux disease questionnaire at Baseline	Diaphragmatic Myofascial Release Group	14	45.2857	4.12177	0.963
	Diaphragmatic Breathing Exercise Group	14	45.3571	3.99223	
Reflux disease questionnaire Post-treatment	Diaphragmatic Myofascial Release Group	13	35.3846	4.48216	0.001
	Diaphragmatic Breathing Exercise Group	13	43.0000	3.87298	

Table 4 given above shows the independent sample test statistics RDQ between group A and B. The table shows that the baseline values of RDQ were not significant (i.e., p= 0.963) which is above level of significance, means that at baseline there was not significant difference among participants, indicating that the samples of both groups were taken from similar population.

The table above shows that the post-treatment values of RDQ are significant between group A and B and have a significance value below 0.05 (i.e., p=0.001), looking at the descriptive statistics in the paired sample test, it is resulted that the group receiving the diaphragmatic myofascial release treatment had significant improvement as compared to the group of participants receiving the diaphragmatic breathing exercises. It is concluded that diaphragmatic myofascial release technique produced statistically significant results on RDQ as compared to the diaphragmatic breathing exercises.

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DISCUSSION

The findings demonstrated that both diaphragmatic myofascial release (DMFR) and diaphragmatic breathing exercises (DBE) were effective in alleviating GERD symptoms, with significant post-treatment improvements observed in both groups. These results align with prior research emphasizing the role of diaphragmatic interventions in improving lower esophageal sphincter function and enhancing diaphragmatic efficiency, leading to reductions in reflux symptoms and better quality of life (11). DMFR, however, emerged as a more effective intervention compared to DBE, which corroborates recent studies highlighting its superior impact on reducing the frequency and intensity of GERD symptoms and improving patients' overall quality of life.

Previous studies have similarly reported the benefits of diaphragmatic techniques. Amin Husseini et al. (2022) identified that diaphragmatic breathing exercises significantly reduced GERD symptoms and improved the quality of life, while recent investigations found that DMFR further amplified these benefits by providing greater symptom relief and improved diaphragmatic functionality (8). Likewise, Mehdi Ahmadi et al. (2022) and Andrew Ming-Liang Ong et al. (2018) supported the therapeutic effects of diaphragmatic breathing in managing GERD symptoms, particularly in PPI-refractory patients. However, recent findings reinforced the view that DMFR offers more substantial improvements in quality of life and GERD symptomatology, making it a preferred intervention for postoperative GERD patients (3, 10). The strengths of this study include its use of validated assessment tools, standardized intervention protocols, and rigorous statistical analyses, ensuring the reliability of the findings. Despite these strengths, the study was not without limitations.

A recent comparative study conducted by Singh et al. (2021) evaluated the efficacy of diaphragmatic myofascial release (DMFR) versus diaphragmatic breathing exercises (DBE) in a cohort of 60 GERD patients over a 12-week intervention period. The study reported that both interventions significantly reduced GERD symptoms and improved quality of life, but DMFR demonstrated superior outcomes across several domains. Patients receiving DMFR experienced a greater reduction in symptom severity scores, with an average decrease of 18.5 points compared to 12.3 points in the DBE group. Additionally, DMFR was associated with a more pronounced improvement in diaphragmatic mobility and lower esophageal sphincter pressure. The authors attributed the enhanced efficacy of DMFR to its targeted impact on the myofascial structures of the diaphragm, which likely resulted in more effective esophageal clearance and reduced reflux episodes. This study further supports the growing evidence favoring DMFR as a more effective intervention for GERD management, particularly in reducing symptom intensity and improving overall patient outcomes (16). The relatively small sample size may limit the generalizability of the results, and reliance on patient-reported outcomes introduced the potential for reporting bias. Additionally, the working hours of the selected healthcare settings might have influenced the accessibility and recruitment of participants.

CONCLUSION

DMFR was found to be more effective than DBE in reducing GERD severity and improving the quality of life in postoperative patients. Future research should address these limitations by incorporating larger sample sizes, exploring the long-term efficacy of these interventions, and investigating the mechanisms underlying DMFR's greater effectiveness. Expanding these efforts could contribute to the development of optimized therapeutic strategies for GERD management.

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AUTHOR CONTRIBUTIONS

Author	Contribution
Hifza Tahir*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Fizzah Tahir	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Fatima Iqbal	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Faiza Tariq	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Iqra Tahir	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ghulam Dastgeer	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Hafiz Ali Bin Asim	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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