



The Effect of Foot Reflexology on the Level of Fatigue, Dyspnea and Anxiety of Chronic Respiratory Patients

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Abstract

Background: Chronic respiratory diseases are among the most common non-communicable diseases globally. Foot reflexology may offer benefits for patients with these conditions.

Objectives: This study aimed to assess the impact of foot reflexology on anxiety, dyspnea, and fatigue in patients with chronic respiratory diseases.

Methods: A quasi-experimental clinical trial was conducted with 34 chronic respiratory patients (moderate to severe lung involvement) from Abadan University of Medical Sciences-affiliated hospitals. Participants were selected through purposive sampling. Reflexology sessions were administered twice a week for six weeks, each lasting 30 minutes, using sweet almond oil. Data were collected through a Socio-demographic Questionnaire, Spielberger State-Trait Anxiety Inventory, Fatigue Severity Scale, and Borg Dyspnea Scale.

Results: After foot reflexology, significant reductions were observed in fatigue, dyspnea, and anxiety scores ($P < 0.05$). Multivariable regression analysis, controlling for confounders, confirmed these reductions in the intervention group.

Conclusions: Foot reflexology is a beneficial complementary treatment alongside conventional medical care for chronic respiratory patients.

Keywords: Reflexology, Respiratory disease, Fatigue, Dyspnea, Anxiety

1. Background

Chronic respiratory diseases (CRDs) are often the most common non-communicable respiratory diseases in the world (1). High-income and developed regions have the highest prevalence of chronic respiratory diseases (2). The highest prevalence of respiratory diseases includes chronic obstructive pulmonary disease (COPD) (global prevalence of 3.9%) and asthma (3.6%) (3). Emerging and prominent studies highlight a series of more significant symptoms that dramatically impact patients' lives, such as shortness of breath, fatigue, and anxiety (4). Dyspnea is one of the common

symptoms of these diseases, which can persist and rapidly worsen in patients. It also leads to activity limitation and impairs quality of life (3). Fatigue correspondingly increases with the severity of dyspnea (5). Increased fatigue can be accompanied by mood, mental, and physical fluctuations and disturb patients' daily activities, including self-care tasks (3). Anxiety is a common mental disorder, especially in patients with asthma, affecting 16% to 52% of asthma patients and 40% of COPD patients (6).

There are several non-pharmacological coping strategies for managing symptoms that nurses can implement as part of the healthcare team. These include

patient education at home, respiratory exercises, progressive relaxation exercises, and reflexology (7). Foot reflexology is a systemic procedure in which the practitioner applies pressure on particular points of the foot sole to stimulate the body and bring health benefits to different parts (8). This type of treatment stimulates the nerves and blood circulation system of the body (9). Currently, the most promising theory suggests that the benefits of foot reflexology may be due to the autonomic nervous system, and it is well known that it relieves stress and anxiety symptoms by reducing anxiety and muscle tension (10).

Regarding the effect of foot reflexology on patients with respiratory problems, it can be mentioned that reflexologists improve lung function, relieve sinus problems and congestion, and relax stiff muscles by stimulating respiratory reflexes (11). A reflexology session can activate the diaphragm, stimulate the lungs, and strengthen the immune system (8). In a study on the effect of foot reflexology on the severity of fatigue and quality of life in hemodialysis patients, Habibzadeh et al. showed that foot reflexology using almond and chamomile oil has a positive effect on reducing fatigue and improving quality of life among hemodialysis patients (12).

2. Objectives

However, limited research exists on the impact of reflexology in CRD patients, particularly in Iran. This study seeks to investigate the effects of foot reflexology on fatigue, dyspnea, and anxiety among chronic respiratory patients, aiming to contribute valuable insights into its potential as a complementary therapy.

3. Methods

3.1. Design

This study employed a two-group pre-test and post-test quasi-experimental design, structured as a clinical trial.

3.2. Participants

The present study is a quasi-experimental clinical trial conducted on hospitalized patients with CRDs presenting moderate to severe lung involvement, who were admitted to teaching hospitals affiliated with Abadan University of Medical Sciences. After obtaining ethical approval from the Ethics Committee of Abadan

University of Medical Sciences (ethical code: [IR.ABADANUMS.REC.1400.156](#)), along with a formal introduction letter and coordination with the educational and research vice-chancellors of the above hospitals, CRD inpatients (including those with COPD, asthma, and bronchitis) were evaluated, and 40 eligible patients were selected through purposive sampling based on the inclusion criteria.

To ensure comparability between the intervention and control groups, a matching procedure was implemented. Patients were matched based on key clinical variables likely to influence disease progression and recovery, including age, sex, severity of lung involvement, and the presence of comorbidities. After matching, participants were randomly assigned to either the intervention or control group ($n = 20$ in each group).

The inclusion criteria comprised having relative independence in performing activities of daily living, maintaining a state of consciousness, a diagnosis of CRDs with moderate to severe lung involvement, and willingness to participate in the study. The exclusion criteria included decreased level of consciousness, leg problems (e.g., blood supply issues, numbness, tissue wounds, or amputations), pregnancy, psychotic disorders, severe liver, heart, or kidney diseases, and the use of other complementary or alternative therapies.

3.3. Sample Size

The sample size was calculated using an effect size of 0.90 from Habibzadeh et al., with a 95% confidence interval and 80% power, requiring at least 16 participants per group (12). To allow for a 25% dropout rate, each group included 20 participants.

3.4. Intervention

The intervention group received foot reflexology sessions twice weekly for six weeks (30 minutes per session) using sweet almond oil. Sessions included general massage for 5 minutes, using circular finger movements, and focused massage for 10 minutes per foot, targeting reflex points for the lungs, solar plexus, and pituitary gland. Both feet were massaged in the supine position. Standardized techniques were performed by two trained therapists (one male, one female) who had undergone targeted reflexology training. These therapists were selected to deliver the intervention and were trained using a standardized

video-based educational program specifically developed for reflexology interventions. The training included comprehensive instructional videos covering reflexology principles. To ensure mastery, the therapists were required to complete a practical evaluation supervised by senior nursing faculty members experienced in complementary therapies. To mitigate psychological bias, the control group received a general oil-free foot massage. Reflexology protocols adhered to strict hygiene practices, with therapists and patients sanitizing hands and feet before sessions. Outcome assessments were conducted two weeks post-treatment by a blinded colleague.

3.5. Questionnaires

Data collection tools include a Socio-demographic Characteristics Questionnaire, which includes questions on level of education, relationship with relatives, and economic status, as well as the Spielberger State-Trait Anxiety Inventory (STAI), the Fatigue Severity Scale (FSS), and the Borg Dyspnea Scale. Each state-trait anxiety inventory consists of 20 items that are answered based on a four-point Likert scale for items with a positive attitude (1, 2, 5, 8, 10, 11, 15, 16, and 20), with options ranging from almost never (4), sometimes (3), most of the time (2), to almost always (1). Options with a negative attitude (items 3, 4, 6, 7, 9, 12, 13, 14, 17, and 18) are scored inversely. The positive items (1, 3, 6, 7, 10, 11, 13, 14, 16, and 19) and negative items (5, 8, 9, 12, 17, 18, and 20) are calculated as above in the state anxiety inventory. Scores of 20 - 30, 31 - 42, 43 - 53, and 54 and more indicate no or minimum, mild, moderate, and severe anxiety in the trait anxiety inventory. Similarly, scores of 20 - 34, 35 - 45, 46 - 56, and 57 and more indicate no or minimum anxiety, mild, moderate, and severe anxiety in the state anxiety inventory, respectively. In Iran, Zakerimoghadam et al. reported Cronbach's alpha coefficients of 0.90 and 0.92 for the trait and state anxiety scales, respectively (13). The content validity of STAI has been confirmed with a Cronbach's alpha coefficient of 94% in the study by Malakoutikhah et al. (14). The FSS scores of 4 and above indicate severe fatigue, while scores less than 4 indicate moderate or mild fatigue. Fatigue is confirmed if the sum of the total scores is equal to or greater than 36, with higher scores indicating a higher degree of fatigue. The Borg Dyspnea Scale is a standard numerical scale mentioned by Daneshmandy et al., where a psychometric and correlation coefficient of 0.84 and a reliability

coefficient of 0.78 are reported for it (15). In this scale, each score (0 to 10) indicates the respiratory condition, with scores of 0 and 10 indicating no dyspnea and peak dyspnea, respectively.

3.6. Data Analysis

Data were analyzed using SPSS version 19. Descriptive statistics, including mean and standard deviation, were used to summarize outcomes. Inferential analyses included paired *t*-tests and multivariate regression to assess the intervention's impact and control for confounding variables. Statistical significance was set at $P < 0.05$.

4. Results

4.1. Characteristics of the Study Population

The study included 40 patients, with six excluded due to health deterioration, death, or loss to follow-up, leaving 34 participants ($N = 17$ per group). Most participants in the intervention group were female, had a mean age of 57, were illiterate or had at least a diploma, had an average income, moderate disease severity, and a history of cardiovascular and respiratory diseases (Table 1).

4.2. Effect of Reflexology on Fatigue

The paired *t*-test revealed a significant reduction in fatigue scores after the intervention ($P = 0.02$), while no significant change was observed in the control group ($P = 0.52$) (Table 2).

4.3. Effect of Reflexology on Dyspnea

The paired *t*-test showed a significant reduction in dyspnea levels in the intervention group after foot reflexology ($P = 0.00$), while no significant change was observed in the control group ($P = 0.63$) (Table 3).

4.4. Effect of Reflexology on Anxiety

The study showed a significant reduction in STAI scores in the intervention group after foot reflexology ($P = 0.00$). However, no significant change was observed in the control group after the oil-free simple massage ($P > 0.05$) (Table 4).

4.5. Relationship Between Fatigue, Dyspnea and Anxiety with Confounding Variables by Multiple Linear Regression Test

Table 1. Characteristics of the Study Population (N = 34)^a

Characteristic	Intervention Group	Control Group
Gender; No.		
Male	6	16
Female	28	18
Age; mean $\pm$ SD	57.352 $\pm$ 14.907	43.823 $\pm$ 11.292
Education		
Illiterate	7 (41.18)	4 (23.53)
Under diploma	3 (17.62)	6 (35.29)
Diploma and higher	7 (41.18)	7 (41.18)
Economic status		
Satisfied	3 (17.65)	1 (5.88)
Moderate	13 (76.47)	9 (52.94)
Weak	1 (5.88)	7 (41.18)
Severity of diseases		
Moderate	12 (70.59)	9 (52.94)
Sever	5 (29.41)	8 (47.06)
Medical history		
Diabetes	1 (2.94)	5 (14.71)
Cardiovascular	2 (5.88)	3 (8.82)
Diabetes and respiratory	1 (2.94)	0
Diabetes and cardiovascular	0	2 (5.88)
Diabetes and cardiovascular and respiratory	3 (8.82)	0
Cardiovascular and respiratory	4 (11.76)	0
Renal	1 (2.94)	3 (8.82)
Respiratory	3 (8.82)	3 (8.82)
No medical history	2 (5.88)	1 (2.94)

^a Values are expressed as No. (%) unless otherwise indicated.**Table 2.** Effect of Reflexology on Fatigue

Fatigue	Mean $\pm$ SE	SD	Confidence Interval (95%)	P-Value
Intervention group (N = 17)				0.02
Before the intervention	38.76471 $\pm$ 0.9759212	4.023826	36.69585	
After the intervention	35.58824 $\pm$ 1.124784	4.637602	33.2038	
Control group (N = 17)				0.52
Before the intervention	38.47059 $\pm$ 1.160368	4.784319	36.01072	
After the intervention	38.58824 $\pm$ 1.060864	4.374055	36.3393	

Multiple linear regression analysis examined the effects of reflexology on dyspnea, fatigue, and anxiety while controlling for confounding variables. The results showed a significant reduction in state anxiety by 18 units and trait anxiety by 13.75 units in the intervention group ($P < 0.05$). Dyspnea also decreased significantly by 2.4 units ($P < 0.05$). Although fatigue was 59% lower in the intervention group than in the control group, this difference was not statistically significant ($P > 0.05$). No

significant changes were observed in the control group for anxiety, dyspnea, or fatigue ($P > 0.05$) (Table 5).

5. Discussion

The findings of this study demonstrated a significant reduction in dyspnea severity exclusively in the intervention group. These results align with the study by Sarikhani et al., which reported that foot reflexology improved asthma symptoms in the intervention group

Table 3. Effect of Reflexology on Dyspnea

Dyspnea	Mean $\pm$ SE	Confidence Interval (95%)	P-Value
Intervention group (N = 17)			0.00
Before the intervention	5.235294 $\pm$ 0.4070104	4.407225	
After the intervention	2.823529 $\pm$ 0.2460765	2.322883	
Control group (N = 17)			0.63
Before the intervention	5.941176 $\pm$ 0.3261923	5.277533	
After the intervention	5.705882 $\pm$ 0.3714509	4.95016	

Table 4. Effect of Reflexology on Anxiety

Anxiety	Mean $\pm$ SE	Confidence Interval (95%)	P-Value
Intervention group (N = 17)			0.00
Manifest anxiety			
Before the intervention	65.58824 $\pm$ 1.645088	62.24128	
After the intervention	46.82353 $\pm$ 2.277181	42.19057	
Hidden anxiety			0.00
Before the intervention	57.17647 $\pm$ 1.301117	54.52933	
After the intervention	43.41176 $\pm$ 1.878788	39.58934	
Control group (N = 17)			0.59
Manifest anxiety			
Before the intervention	49.41176 $\pm$ 2.353125	44.6243	
After the intervention	51.05882 $\pm$ 1.960024	47.07112	
Hidden anxiety			0.57
Before the intervention	43.94118 $\pm$ 2.151386	48.3182	
After the intervention	45.52941 $\pm$ 1.809122	41.84872	

by increasing oxygen saturation and reducing breathing rates (16). Similarly, Jamali Soltani et al. found that foot reflexology was significantly effective in improving physiological responses, thereby alleviating respiratory distress in premature infants (17).

In the current study, after adjusting for potential confounders, the paired *t*-tests and multiple regression models also showed a statistically significant reduction in both state and trait anxiety levels in the intervention group. No such changes were observed in the control group. These findings are consistent with the study by Ren et al., which assessed anxiety levels in patients prior to cervical spine surgery. In their study, 10-minute massages with sweet almond oil, performed every other day for four weeks, led to a significant reduction in anxiety scores (18). Fritz and Paholsky further emphasized that foot stimulation activates the parasympathetic nervous system and downregulates stress hormones, contributing to anxiety reduction (19).

However, Gunnarsdottir and Jonsdottir found somewhat contradictory results when investigating the

effect of foot reflexology on anxiety in patients undergoing vascular graft surgery. Their findings indicated only a slight reduction in anxiety scores following the intervention (20). This discrepancy could be attributed to the long interval between the reflexology sessions and the start of surgery, as well as the lack of control over potential confounders such as the use of anti-anxiety medications or other complementary therapies.

In addition to improvements in dyspnea and anxiety, this study found a significant reduction in fatigue levels among chronic respiratory disease patients in the intervention group compared to the control group. This finding is supported by Sajadi et al., who demonstrated that four weeks of foot reflexology massage (twice a week, 30 - 40 minutes per session) significantly reduced fatigue levels in patients with multiple sclerosis (21).

5.1. Limitations

Table 5. Relationship Between Fatigue, Dyspnea and Anxiety with Confounding Variables by Multiple Linear Regression Test

Variables	Odds Ratio	SE	z	P > z	Confidence Interval (95%)	Interval
Fatigue (intervention group)						
After intervention	0.4163874	0.3252505	-1.12	0.262	0.0900748	1.924829
Gender (female)	0.6901259	0.7833979	-0.33	0.744	0.0745908	6.385157
Education						
Under diploma	0.3749825	0.417209	-0.88	0.378	0.04236	3.319447
Diploma and higher	0.8442963	0.7686895	-0.19	0.853	0.1417485	5.02888
Economic status (moderate)	1.331125	1.60828	0.24	0.813	0.1246776	14.21181
Severity (moderate)	1.24121	1.306359	0.21	0.837	0.1577484	9.766195
Cons	11.14933	29.65811	0.91	0.365	0.0606716	2048.862
Fatigue (control group)						
After intervention	1.520504	1.401723	0.45	0.649	0.2496212	9.261762
Gender (female)	1.785532	2.306334	0.45	0.654	0.1420001	22.45157
Education						
Under diploma	0.0838451	0.1262228	-1.65	0.100	0.0043859	1.602877
Diploma and higher	0.2700703	0.4093585	-0.86	0.388	0.0138443	5.268458
Economic status (moderate)	7.807444	13.48095	1.19	0.234	0.2647017	230.2825
Severity (moderate)	0.9749052	1.447062	-0.02	0.986	0.0531514	17.88174
Cons	0.9867094	4.743248	-0.00	0.998	0.0000799	12190.8
Dyspnea (intervention group)						
After intervention	-2.411765	0.4788656	-5.04	0.000	-3.389739	-1.433791
Gender (female)	0.243229	0.6496193	0.37	0.711	-1.083471	1.569929
Age	0.0214143	0.0171232	1.25	0.221	-0.013556	0.0563846
Cons	5.975351	1.880246	3.18	0.003	2.135376	9.815325
Dyspnea (control group)						
After intervention	-0.2352941	0.4964469	-0.47	0.639	-1.249174	0.7785856
Gender (female)	0.243229	0.6496193	0.37	0.711	-1.083471	1.569929
Age	0.0214143	0.0171232	1.25	0.221	-0.013556	0.0563846
Cons	5.975351	1.880246	3.18	0.003	2.135376	9.815325
Manifest anxiety (intervention group)						
After intervention	-18.16122	3.911156	4.64	0.000	-9.975075	-26.34736
Gender (female)	5.550546	4.224383	1.31	0.205	-3.29119	14.39228
Age	0.0497863	0.1665574	0.30	0.768	-0.2988223	0.3983948
Severity (moderate)	0.3513172	3.90109	0.09	0.929	-7.813759	8.516393
Education						
Under diploma	8.9175	5.528558	1.61	0.123	-2.653905	20.48891
Diploma and higher	11.06385	5.169791	2.14	0.046	0.2433503	21.88434
Cons	2.709734	22.88392	0.12	0.907	-45.18685	50.60632
Manifest anxiety (control group)						
After intervention	-2.650652	2.800325	-0.95	0.355	-8.492027	3.190723
Gender (female)	1.587219	4.386119	0.36	0.721	-7.562064	10.7365
Age	-0.0222838	0.2585986	-0.09	0.932	-0.561711	0.5171436
Severity (moderate)	-1.805716	5.520662	-0.33	0.747	-13.32162	9.710184
Education						
Under diploma	-7.686964	4.573678	-1.68	0.108	-17.22749	1.853561
Diploma and higher	-6.473097	6.47071	-1.00	0.329	-19.97076	7.024567
Cons	38.79996	20.71836	1.87	0.076	-4.41781	82.01769
Hidden anxiety (intervention group)						
After intervention	-13.76471	2.292615	6.00	0.000	-9.082562	-18.44685
Gender (female)	-0.0697478	3.110114	-0.02	0.982	-6.421448	6.281952
Age	-0.1067062	0.081979	-1.30	0.203	-0.2741297	0.0607174
Cons	35.89416	9.001856	3.99	0.000	17.50992	54.2784
Hidden anxiety (control group)						
After intervention	-1.588235	2.881133	-0.55	0.586	-7.472294	4.295823
Gender (female)	0.8150178	2.912204	0.28	0.782	-5.132495	6.762531
Age	0.0861672	0.1326778	0.65	0.521	-0.1847971	0.3571315
Cons	42.095	9.017355	4.67	0.000	23.6791	60.51089

This study had several limitations, including a small sample size that reduced generalizability. Changes in patient conditions, ICU admissions, mortality, early discharge, and poor adherence further decreased participation. These challenges highlight the difficulties of conducting clinical trials with critically ill patients. Future studies should use larger samples, include a wider range of CRDs, and implement strategies to improve adherence and reduce attrition for more reliable results.

5.2. Conclusions

This study found that foot reflexology significantly alleviates dyspnea, anxiety, and fatigue in patients with CRDs. These results highlight its potential as a complementary therapy alongside conventional treatments. Given similar findings in other studies, reflexology may also help manage these symptoms in other chronic conditions. Further research is needed to assess its long-term effects and broader clinical applications.

Footnotes

Authors' Contribution: All the authors have made substantial contributions to the article, meeting the criteria for author eligibility. M. Gh. M. conceived the study design and guided the whole process of the study. B. S., R. M., and R. Z. participated in the data collection and intervention. K. M. performed the data analysis.

Clinical Trial Registration Code: IRCT20220405054421N1.

Conflict of Interests Statement: The authors declared no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication. The data are not publicly available due to privacy restrictions and institutional policies. Access to the dataset requires approval from the relevant ethics committee and adherence to confidentiality agreements. Researchers interested in obtaining the data should contact the corresponding author and provide a formal request outlining the intended use of the data.

Ethical Approval: This study is approved under the ethical approval code of IR.ABADANUMS.REC.1400.156.

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