RESEARCH PAPER

Comparative Effects of Siwa Sand Therapy and Sulphurous Water Baths on Pain, Health Status, and Quality of Life in Women with Fibromyalgia: A Randomized Controlled Trial

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Abstract

Purpose: This study was conducted to compare the effects of Siwa sand baths and sulphurous water baths on pain intensity, health status, and quality of life (QoL) in women with fibromyalgia (FM).

Methods: Forty-eight women diagnosed with FM were randomly assigned to either the Siwa sand bath group (n = 24) or the sulphurous water bath group (n = 24). Participants in both groups received a standardized daily exercise program for seven consecutive days. In addition, participants in the Siwa sand bath group underwent seven consecutive days of Siwa sand bath therapy, whereas those in the sulphurous water bath group received seven consecutive days of sulphurous water bath therapy. Health status and fibromyalgia symptom severity were assessed using the Revised Fibromyalgia Impact Questionnaire (RFIQ), pain intensity was evaluated using the Visual Analogue Scale (VAS), and QoL was measured using the Short Form-36 questionnaire (SF-36). Outcome measures were assessed at baseline, immediately after the 7-day intervention period, and at one-month follow-up.

Results: Baseline comparisons revealed no significant differences between groups ($p > 0.05$). Both groups demonstrated significant improvements in RFIQ, VAS, and SF-36 scores following treatment and at follow-up compared with baseline values ($p < 0.001$). However, post-treatment and follow-up analyses showed statistically significant differences in favor of the Siwa sand bath group across all measured outcomes ($p < 0.05$).

Conclusion: Siwa sand baths combined with a daily exercise program may provide superior and more sustained therapeutic benefits than sulphurous water baths combined with the same exercise program in women with FM, resulting in significant improvements in pain, health status, and QoL.

Keywords: Fibromyalgia; Siwa sand bath; Sulphurous water bath; Pain; Quality of life; Health status.

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Introduction

Fibromyalgia (FM) is a chronic musculoskeletal syndrome characterized by widespread pain accompanied by fatigue, sleep disturbances, cognitive dysfunction, mood alterations, and reduced physical function (**Wolfe et al., 2010; Clauw, 2014**). The prevalence of FM ranges between 2% and 6% worldwide and predominantly affects women during their most productive years (**Queiroz, 2013; Heidari et al., 2017**). The persistent symptoms associated with FM significantly impair daily activities, social participation, and quality of life (QoL), resulting in substantial healthcare utilization and socioeconomic burden (**Jones et al., 2015; White et al., 2008**).

Despite the increasing understanding of FM, its underlying pathophysiological mechanisms remain incompletely understood (**Clauw, 2014)**. Current management strategies are mainly directed toward symptom control rather than disease cure. Pharmacological interventions may provide temporary relief; however, their long-term use is often limited by adverse effects and insufficient clinical response (**Hauser et al., 2011; Uceyler et al., 2008**). Consequently, increasing attention has been directed toward non-pharmacological approaches aimed at improving pain, physical function, and QoL in women with FM (**Busch et al., 2011**).

Exercise therapy is currently considered one of the cornerstone interventions in FM management with aerobic and flexibility exercises have demonstrated beneficial effects on pain perception, physical performance, psychological well-being, and overall health status (**Busch et al., 2011**). Nevertheless, many patients continue to experience persistent symptoms despite regular exercise participation, emphasizing the need for additional complementary therapeutic strategies (**Bernardy et al., 2018; Nuesch et al., 2013**).

On the other hand, natural therapeutic modalities have been utilized for centuries in the management of musculoskeletal disorders. Among these modalities, sand bathing (psammotherapy) and sulphurous mineral water bathing have gained considerable attention because of their potential analgesic, relaxing, and therapeutic properties (**Masiero et al., 2018; Fiorayanti et al., 2011**). Siwa Oasis in Egypt is internationally recognized for its traditional sand-bath therapy, where individuals are exposed to naturally heated desert sand under controlled conditions. **EL-Shazly et al., 2016** previous investigations have suggested that sand baths may enhance circulation, promote muscle relaxation, improve metabolic activity, and contribute to symptom reduction in various rheumatic disorders.

Similarly, sulphurous mineral water therapy has been widely used in spa medicine and rehabilitation settings (**Galvez et al., 2018**). The therapeutic benefits of sulphurous water have been attributed primarily to hydrogen sulfide, a biologically active compound with antioxidant, anti-inflammatory, vasodilatory, and analgesic properties (**Wallace & Wang, 2015; Kloesch et al., 2010**). Clinical evidence has demonstrated favorable effects of sulphurous water bathing on pain reduction, physical function, and QoL among patients with chronic musculoskeletal conditions (**Fioravanti et al., 2011; Bender et al., 2005**). A randomized controlled trial conducted by **Saleh et al., 2022** demonstrated that both interventions significantly reduced pain and improved physical function in patients with rheumatoid arthritis, while Siwa sand therapy produced greater long-term improvements in inflammatory biomarkers and functional outcomes.

Given the chronic nature of FM and the growing interest in evidence-based complementary therapies, determining the relative effectiveness of different natural therapeutic interventions is clinically important. To the best of our knowledge, no previous randomized controlled study has compared the effects of Siwa sand therapy and sulphurous water baths on pain intensity, health status, and QoL in women with FM. Therefore, the present study aimed to compare the effects of these two natural therapeutic modalities on pain, health status, and QoL in women with FM.

Methods

Study Design

This study was designed as a prospective, parallel-group, single-blinded randomized controlled trial. The study was conducted at Faculty of Physical Therapy, Kafr Elsheikh University; in collaboration with the therapeutic tourism centers in Siwa Oasis, Egypt. Ethical approval was obtained from the Institutional Research Ethics Committee before study commencement (KFSIRB200-1129). All participants received detailed information regarding the study procedures and provided written informed consent prior to enrollment.

Participants

Forty-eight women diagnosed with FM according to the 2016 American College of Rheumatology criteria were recruited. Participants were eligible if they met the following criteria: Female patients aged 25–55 years; Confirmed diagnosis of FM by a rheumatologist; Revised Fibromyalgia Impact Questionnaire (RFIQ) score ≥ 60; Pain intensity ≥ 4 on the Visual Analogue Scale (VAS); Stable medication regimen during the preceding three months; and ability to participate in the exercise program. While participants were excluded if they had: Rheumatoid arthritis or other inflammatory rheumatic diseases; Severe cardiovascular, pulmonary, hepatic, or renal disorders; Neurological diseases affecting sensory or motor functions; Active skin disorders contraindicating sand or water bathing; Malignancy; Pregnancy or lactation; or Participation in regular exercise programs within the previous six months.

Randomization and Blinding

Participants were randomly assigned into two equal groups using a computer-generated randomization sequence with a 1:1 allocation ratio. Group A (Siwa Sand

Bath group) received Siwa sand bath therapy combined with a daily exercise program. Group B (Sulphurous Water Bath group) received sulphurous water bath therapy combined with the same daily exercise program. Allocation concealment was achieved through sealed opaque envelopes prepared by an independent researcher who was not involved in recruitment, treatment, or assessment. Outcome assessment was performed by a blinded assessor. A randomization process was performed for 48 patients allocated randomly to one of the following two groups: Group (A): Siwa sand bath group (n=24), and Group (B): Sulphurous water bath group (n=24). A diagram of patient retention and randomization throughout the study is described as shown in figure (1).

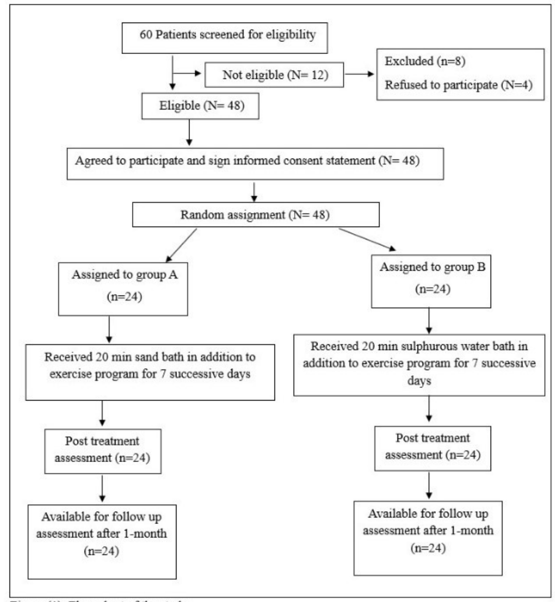

Figure (1): Flow chart of the study.

Interventions

Group A (Siwa Sand Therapy)

Participants assigned to Group A underwent Siwa sand therapy for 20 minutes daily over seven consecutive days. The treatment was conducted at Dakrour Mountain in Siwa Oasis during the summer months (June–August), between 2:00 p.m. and 4:00 p.m., when the environmental temperature ranged from 40°C to 45°C. Surface sand temperatures varied between 75°C and 82°C, while temperatures at a depth of 10–20 cm ranged from 50°C to 60°C, as measured using an infrared thermometer (Medisana, Germany). Each morning, a shallow pit measuring approximately 1.0–1.5 m in length, 80 cm in width, and 20–40 cm in depth was prepared to allow solar heating of the sand. During treatment, each participant lay in the pit while the body was covered with hot, dry desert sand up to the neck, leaving the head exposed. After 20 minutes, participants were carefully removed from the sand and immediately wrapped in a towel to minimize exposure to air currents and reduce the risk of adverse effects such as headache or muscle stiffness. Following the sand bath, participants rested inside an enclosed tent adjacent to the treatment area for approximately 15 minutes to allow gradual cooling and normalization of body temperature. Throughout the treatment period, participants were instructed to replace sweat-soaked clothing with dry garments, gently remove residual sand using a towel, and maintain adequate hydration by consuming warm beverages such as licorice, anise, or lemon drinks.

Additional instructions included avoiding the use of skin creams or lotions before treatment, refraining from showering during the treatment period, washing only the face and hands with warm water, avoiding the application of water to the remainder of the body, and abstaining from consuming cold beverages or using air conditioning until three days after completion of the treatment course.

Group B (Sulphurous Water Bath Therapy)

Participants allocated to Group B received sulphurous water bath therapy for 20 minutes daily over seven consecutive days at Prezi Spa, Siwa Oasis. Each participant immersed the body in a thermal sulphurous water pool maintained at a temperature of 36–37°C. The sulphate concentration of the mineral water was approximately 820 mg/L. Participants were instructed to remain relaxed and avoid swimming or performing any physical activity during the bathing session. At the end of each session, they carefully dried themselves, dressed in dry clothing, and were wrapped to minimize exposure to air drafts during the cooling period.

Exercise program

Participants in both groups participated in an identical supervised exercise program once daily for seven consecutive days. Each session lasted approximately 45 minutes and consisted of: Warm-up exercises (10 minutes), including comfortable walking and active range-of-motion exercises. Stretching exercises (25 minutes) targeting the cervical, shoulder, thoracic, lumbar, gluteal, hamstring, pectoral, and calf muscles. Cool-down exercises (10 minutes), including relaxation and breathing exercises. Each stretching exercise was held for 30 seconds and repeated three to five times with adequate rest intervals between repetitions. Exercise intensity was maintained at a low-to-moderate level to ensure participant comfort and minimize symptom exacerbation.

Outcome Measures

A single evaluator, unaware of the study's objectives, conducted assessments for all participants in both groups, measuring each participant's outcomes on an individual basis at pre-treatment, immediately after completion of the 7-day intervention period, and one-month follow-up.

Assessment of health status and fibromyalgia symptoms severity:

The change in the total score of the RFIQ represented the primary outcome. The RFIQ, is a thoroughly validated tool that assesses the overall severity of FM and health status based on participant ratings. It encompasses three key domains similar to the FIQ (function, overall impact, and symptoms), with additional inquiries regarding memory, tenderness, balance, and environmental sensitivity (**Srifi et al., 2013**). Regarding functional impact, participants rate the difficulty level faced in daily tasks on a scale from 0 (none) to 10 (highest) over the preceding week. Activities evaluated include brushing or combing hair, and lifting and carrying grocery bags, among others. Additionally, two questions assess the total impact of FM on achieving weekly goals and the extent to which symptoms overwhelmed the participants, rated from 0 (never) to 10 (always). Furthermore, the severity of symptoms including pain, energy levels, sleep quality, and stiffness are rated on a scale from 0 to 10. The total maximal RFIQ scores of 100 correspond to a significant detrimental impact or severe symptomatology (**Bennett et al., 2009**). The RFIQ exhibits strong correlations with the three corresponding domains of the FIQ and has effectively discriminated between individuals with FM from those with systemic lupus erythematosus, rheumatoid arthritis, major depression, and healthy individuals (**Bennett et al., 2009**).

Pain intensity

It was evaluated through VAS of 10 cm, where patients rated their pain on a scale from 0 ("no pain") to 10 ("extremely severe pain "). The VAS is extensively applied in the measurement of pain levels in FMS patients, showing an intraclass correlation coefficient (ICC) of 0.97 in chronic pain cases (**Alghadir et al., 2018**).

Short Form 36 Questionnaire for quality of life:

To assess the QoL, Health Short Form 36 (SF-36) was used. The SF-36 serves as a multi-faceted survey tool utilized across various populations to compare the relative disease burdens and provide a distinction between the health advantages of diverse treatment approaches (**Al Omari et al., 2109**). The questionnaire consists of 8 sections, including general health, mental health, physical function, body pain, emotion, physical role, vitality, and social activity. The elements are recorded and weighed to produce a standardized score of 0 to 100. Where zero denotes a low QoL and 100 denotes the highest QoL (**Demiral et al., 2006**).

Sample Size Calculation

The sample size was calculated using G*Power software (version 3.1.9.7) based on the primary outcome measure, the RFIQ score. Assuming a large effect size (Cohen's $d = 0.80$), a statistical power of 80%, and a two-sided significance level (α) of 0.05, the minimum required sample size was 42 participants (21 per group). To compensate for potential dropouts, an additional 10–15% of participants were recruited, resulting in a target sample size of approximately 48 participants (24 per group).

Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software (Version 29.0; IBM Corp., Armonk, NY, USA). Data were examined for normality of distribution, and homogeneity of variance before conducting the statistical analyses. Descriptive statistics were calculated for all variables and are presented as mean ± standard deviation (SD) for continuous variables and frequencies and percentages for categorical variables. Baseline demographic and clinical characteristics were compared between the two groups using the independent-samples *t*-test for continuous variables and the chi-square test for categorical variables. A mixed multivariate analysis of variance (Mixed MANOVA) was performed to evaluate the effects of time (pre, post I and post II)), treatment (Siwa sand therapy versus sulphurous water bath therapy), and the time × treatment interaction on the outcome measures, including VAS, RFIQ, and SF-36 scores. The level of statistical significance was set at $p < 0.05$ for all statistical analyses.

Results

Table 1 presents the demographic data of the participants in both groups. No statistically significant differences were observed between the two groups at baseline regarding their age, weight, height, BMI, and marital status ($p > 0.05$).

Table 1. Baseline demographics of participants

	Study group	**Control group**	**p-value**
	Mean ± SD	**Mean ± SD**	
Age (years)	41.23 ± 8.65	39.19 ± 8.16	0.52
Weight (kg)	68.57 ± 8.21	66.65 ± 7.68	0.49
Height (cm)	161.15 ± 8.05	162.31 ± 6.93	0.56
BMI (kg/m²)	25.28 ± 2.64	24.54 ± 2.28	0.27
Marital status, n (%)			
Married	14 (58.3%)	13 (54.2%)	

Single	6 (25.0%)	8 (33.3%)	0.85
Divorced	4 (16.7%)	3 (12.5%)	

SD, standard deviation; p-value, level of significance; BMI, body mass index

Within-Group Comparison

Table 2 presents the group means and standard deviations for each outcome measure at each evaluation period. In addition, the within-group differences for each variable are presented for the comparisons between post-treatment (Post I) and baseline, as well as between the one-month follow-up assessment (Post II) and baseline. As shown in the table, both groups demonstrated statistically significant improvements in RFIQ, VAS, and SF-36 scores after 7 days of treatment and at the one-month follow-up compared with baseline ($p < 0.05$).

	Group	Pre-treatment Mean ± SD	Post (1) Mean ± SD	Post (2) Mean ± SD	P value Post (I) vs Pre-treatment	P value Post (II) vs Pre-treatment
RFIQ	A	61.30 ± 6.24	30.26 ± 5.37	35.10 ± 5.62	0.001	0.001
	B	62.92 ± 5.65	46.87 ± 6.16	52.10 ± 5.84	0.001	0.003
VAS	A	6.87 ± 0.47	2.56 ± 0.42	3.08 ± 0.51	0.001	0.001
	B	6.45 ± 0.45	4.22 ± 0.49	4.95 ± 0.53	0.001	0.002
SF-36 scores	A	43.42 ± 10.58	73.68 ± 9.28	69.95 ± 9.54	0.001	0.001
	B	47.72 ± 10.65	60.68 ± 9.18	56.40 ± 9.32	0.001	0.004

Table 2. Mean ± SD for all variables in both groups at each evaluation period, and comparison of changes in outcome measures at pretreatment, post (I) and post (II) within each treatment group.

SD, Standard Deviation; P-value, Level of significance; VAS, Visual Analogue Scale; RFIQ, Revised Fibromyalgia Impact Questionnaire; SF-36, Health Short Form 36.

Between-Group Comparison

Table 3 presents the between-group differences for each outcome measure at the end of the 7-day treatment period (Post I) and at the one-month follow-up assessment (Post II). After 7 days of treatment, the analysis demonstrated statistically significant differences between the two groups in all measured outcomes. Participants in Group A showed significantly lower RFIQ scores (p = 0.001) and pain intensity measured by the VAS (p = 0.001), together with significantly higher SF-36 scores (p = 0.001), compared with Group B. At the one-month follow-up, the between-group analysis also revealed statistically significant differences in favor of Group A for all outcome measures. Participants in Group A continued to demonstrate significantly lower RFIQ scores (p = 0.003) and VAS scores (p = 0.002), as well as significantly higher SF-36 scores (p = 0.004), compared with those in Group B.

Table 3. Differences between treatment groups on each outcome measure after 7 days of treatment and at 1-month follow-up.

	Post I (Mean ± SD)		p-value	Post II (Mean ± SD)		p-value
	Group A	**Group B**		**Group A**	**Group B**	
FIQR	30.26 ± 5.37	46.87 ± 6.16	0.001	35.10 ± 5.62	52.10 ± 5.84	0.003
VAS	2.56 ± 0.42	4.22 ± 0.49	0.001	3.08 ± 0.51	4.95 ± 0.53	0.002

SF-36 scores	73.68 ± 9.28	60.68 ± 9.18	0.001	69.95 ± 9.54	56.40 ± 9.32	0.004

P-value, Level of significance; VAS, Visual Analogue Scale; RFIQ, Revised Fibromyalgia impact Questionnaire; SF-36, Health Short Form 36.

Discussion

The present randomized controlled trial was conducted to compare the effects of Siwa sand baths and sulphurous water baths on pain intensity, health status, and QoL in women with FM. The findings demonstrated significant improvements in all measured outcomes within both groups following treatment. However, participants who received Siwa sand baths exhibited significantly greater improvements in pain intensity, health status, and QoL compared with those who received sulphurous water baths. Furthermore, the superiority of Siwa sand baths remained evident during the follow-up assessment, suggesting a more sustained therapeutic effect.

The significant improvements observed in both groups may be attributed to the combined influence of thermal therapy and exercise training. Exercise remains one of the most strongly recommended non-pharmacological interventions for FM management and has consistently demonstrated beneficial effects on pain, fatigue, physical function, and health-related QoL (**Macfarlane et al., 2017**). Aerobic and stretching exercises have been shown to improve physical function, reduce stiffness, and enhance symptom control in patients with FM (**Bidonde et al., 2017**). Exercise may support endogenous pain modulation and reduce physical deconditioning associated with chronic pain conditions (**Macfarlane et al., 2017**). Consequently, the improvements observed in both groups may partially reflect the beneficial effects of the exercise program administered throughout the study period.

Regarding pain intensity, both interventions resulted in substantial reductions in VAS scores. The improvement observed in the sulphurous water bath group may be explained by the therapeutic properties attributed to hydrogen sulfide, a major bioactive component of many sulphurous mineral waters. Experimental and review literature suggests that hydrogen sulfide has anti-inflammatory, antioxidant, vasoregulatory, and cytoprotective effects (**Cirino et al., 2023; Pawlik-Sobecka et al., 2021; Davinelli et al., 2019**). In addition, immersion in warm water can promote muscle relaxation, increase peripheral circulation, and reduce pain and muscle spasm, which may contribute to symptom relief (**Fioravanti et al., 2011; Naumann & Sadaghiani, 2014**). These physiological responses may collectively decrease peripheral nociceptive input and contribute to the reduction in pain perception observed among women with FM.

The greater reduction in pain observed in the Siwa sand bath group may be explained by the unique thermal and environmental characteristics of sand bathing. During sand therapy, the body is exposed to naturally heated sand that provides prolonged thermal stimulation. Thermal exposure is generally associated with increased local blood flow, muscle relaxation, and reduced pain perception (**Nadler et al., 2004**). This deep heating effect may increase blood flow to muscles and connective tissues, reduce muscle tension, and enhance relaxation, thereby improving pain tolerance (**Lehmann and de Lateur, 1990**).

Fibromyalgia is currently understood as a disorder characterized in part by central sensitization, in which pain-processing pathways become excessively responsive to sensory input (**Clauw, 2014**). Therefore, interventions capable of modulating central pain mechanisms may provide clinically meaningful improvements (**Cramer et al., 2022; Larson et al., 2014**). The superior pain reduction observed following Siwa sand bathing may indicate a greater influence on central sensitization processes through combined thermal, sensory, and relaxation-related mechanisms; however, this interpretation remains hypothetical and requires further mechanistic investigation.

Concerning health status, both groups demonstrated significant improvements in RFIQ scores following treatment. These findings indicate that the interventions positively influenced multiple dimensions of FM symptom burden rather than pain alone. The FIQ is designed to assess functioning, overall impact, and symptom domains commonly affected in FM, including fatigue, sleep, stiffness, mood, and daily activity limitations (**Burckhardt et al., 1991**). Therefore, the observed improvement may be related to reductions in pain severity, and improved ability to engage in daily activities, which is consistent with the multidimensional nature of FM outcomes (**Macfarlane et al., 2017**).

The greater improvement in RFIQ scores observed in the Siwa sand bath group may be explained by the multidimensional effects of sand therapy. Beyond thermal exposure, treatment in a calm natural environment may promote relaxation and reduce psychological stress; as stress is widely recognized as a factor associated with worsening FM symptoms and symptom perception (**Thieme et al., 2004**). Therefore, the relaxing environment associated with sand therapy may have contributed to improvements in both physical and psychological domains.

Another potential explanation for the superior outcomes associated with Siwa sand baths involves the mineral composition of the sand itself. The Geological studies showed that Siwa sand represented enriching in Ca, high amounts of magnesium and iron along with high concentrations of silica carbonates (**Kandil, 2006**). These elements are free to pass through the epidermis and to be absorbed into the cells of the dermis. Also, sand baths and exposure to sunlight helps to provide the body with vitamin D, which aids in calcium metabolism and bone formation and increases their interaction with the function of the immune system (**Marques et al., 2010**), and it is well known that vitamin D therapy in combination with Ca therapy increases the absorption capacity of calcium and magnesium which is very necessary for human health (**Dawodu et al., 2015**).

Regarding QoL, improvements in SF-36 scores suggest that both interventions positively influenced participants' perceptions of their physical and mental health. The reduction in pain and symptom severity likely enabled participants to perform daily activities with less difficulty and greater independence, thereby enhancing QoL. (**Clauw, 2014; Arnold et al., 2008**). So, the greater improvement in QoL observed among participants receiving Siwa sand baths may be related to the larger reductions in pain and disease impact achieved in this group. Previous studies have shown that greater pain severity in FM is associated with poorer QoL and functional status (**Arnold et al., 2008**). As pain decreases, patients often experience better sleep, improved activity levels, and better overall well-being (**Macfarlane et al., 2017**). Therefore, the superior pain-relieving effects of sand therapy may have produced secondary improvements across multiple QoL domains.

An interesting finding of the present study was the persistence of treatment benefits during the follow-up period, particularly in the Siwa sand bath group. While both groups maintained improvements relative to baseline values, the magnitude of improvement remained greater among participants who received sand therapy. This observation suggests that the physiological and behavioral effects of sand bathing may extend beyond the immediate treatment period. Long-lasting changes in pain perception, muscle relaxation, activity tolerance, or psychological well-being may contribute to maintenance of therapeutic gains after treatment completion. This is supported by **Gomes, 2013** who reported that, sand therapy as one of the different natural treatment methods, helps tissues get rid of the toxic substances accumulated in them, which helps to strengthen them and their ability to perform their functions with maximum efficiency.

The present study possesses several strengths. This is among the first randomized controlled trials comparing Siwa sand baths and sulphurous water baths in women with FM. The study also incorporated validated outcome measures addressing multiple dimensions of FM, including pain, health status, and QoL. Furthermore, the inclusion of a follow-up assessment allowed evaluation of treatment persistence beyond the intervention period. Despite these strengths, several limitations should be acknowledged. The study included only female participants, limiting the generalizability of findings to male patients with FM. The relatively short follow-up period did not allow assessment of long-term treatment effects. In addition, biological markers related to pain modulation, inflammation, stress response, and neuroendocrine function were not evaluated. Future studies should investigate the effects of sand bathing and sulphurous water baths on biomarkers such as inflammatory, and oxidative stress biomarkers to further clarify the mechanisms underlying clinical improvement. Moreover, larger multicenter trials with extended follow-up periods are recommended to confirm the present findings and establish the long-term effectiveness of Siwa sand therapy and sulphurous water baths in FM management.

Conclusion: Siwa sand baths may be a promising therapeutic approach for women with FM, demonstrating superior and more sustained improvements in pain intensity, FM health status, and QoL compared with sulphurous water baths.

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