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A comparative study into the effects of topical hot salt and hot sand on patients' perception of low back pain

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Abstract:

BACGROUND: Low back pain (LBP) has been regarded as one of the musculoskeletal problems which is affecting more than three-quarters of individuals in their lifetime. Nowadays, various pharmacological and nonpharmacological therapies are employed for relieving and treating LBP. This study was conducted to compare the effects of topical hot salt and hot sand on patients' perception of LBP.

MATERIALS AND METHODS: In this, quasi-experimental study patients with LBP referring to the orthopedic clinic of Shahrekord educational hospital were divided randomly into two interventions and one control group in 2020. All three groups were received naproxen cream and daily physiotherapy in the same manner, the interventional groups in addition either topical hot salt or topical hot sand. Data gathering tool for measuring patients' perception of LBP was the McGill Pain Short Form Questionnaire to be completed at the beginning, immediately at the end, and 2 months after the intervention. The data were analyzed using SPSS statistical software (version 21.0).

RESULTS: Totally, 90 patients were randomized based on the table of random numbers (mean age 51.1 + 11.1), and finally, 87 patients completed the study. Patients' perception of LBP before the intervention was homogenous in hot salt, hot sand, and the control group The mean score of total pain experience before the intervention was 14.1 ± 11.3 for hot sand, 13.9 ± 10.7 for hot salt and 13.7 ± 10.1 for control group The mean scores of these three groups were not significant before the intervention ($P > 0.05$). The mean score of total pain experience immediately after the intervention was 6.7 ± 4.2 for hot sand, 5.2 ± 3.1 for hot salt and 13.9 ± 9.8 for control group. The mean scores of the hot sand group and the hot salt group were significantly decreased compared with control group ($P > 0.05$). The mean score of total pain experience two months after the intervention was 5.6 ± 3.27 for hot sand, 4.21 ± 2.14 for hot salt and 13.8 ± 10.4 for control group. Mean score of total pain experience in both intervention groups had significantly reduced two months after the intervention compared to control group ($P \leq 0.001$); so that the effect of hot salt treatment on reducing total pain experience was larger than hot sand ($P \leq 0.001$). The same trend was observed for VAS and Present pain intensity variables.

CONCLUSIONS: The findings have revealed that the topical treatments with hot salt and hot sand could have a significant effect on the perception of LBP compared to those in the control group; whereas hot salt might be stronger effects than hot sand on reducing LBP.

Keywords:

Complementary therapies, hot salt, hot sand, low back pains

Introduction

Low back pain (LBP) has been regarded as one of the musculoskeletal problems which is affecting more than three-quarter of individuals in their lifetime, and it has been also known as the second musculoskeletal disorders.[1,2] According to the available data for the United States, LBP has been

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introduced as the most common factor which is constraining daily living activities in people under the age of 45, the fifth factor for hospitalization, and the third most common cause of back pain surgery.[3,4]

The lifetime of LBP prevalence is approximately 85%. Close to 90% of all cases of LBP are nonspecific LBPs. The average global prevalence of LBP has reached 31%, and 38.0% annual prevalence and 18.3% mean point prevalence.[5] The countries where point prevalence has been reported include China (34.1%), Bangladesh (20.1%), Iran (14.8), United Kingdom (9.0%), and India (29.5%).[6] In Iran, nearly 31% of population is annually affected with LBP.[7] Moreover, LBP and its symptoms may be acute, subacute, and chronic. Considering the subacute, rather recent onset or somewhat rapid change, in contrast, acute indicates very sudden onset or rapid change, and chronic indicates indefinite duration or virtually no change.[8]

Nowadays, various pharmacological and nonpharmacological therapies are employed for relieving and treating LBP.[9] In the Iranian context of caring for LBP, over 40% of people use traditional and complementary medicine.[10] Heat therapy is currently used to treat pains in both superficial (topically for cutaneous lesions) and deep (for joints or muscles) forms.[11] In addition, heat can reduce muscle spasm and pain and consequently increase blood circulation, neuromuscular transmission, tissue metabolism, and collagen flexibility.[12]

Atkinson *et al*. believed that various treatments such as heated stones, hot urine, hot water, and ice have been proposed for healing of puncture wounds, although many have a little scientific basis. The use of heat therapies, previously reserved for penetrating fish spine injuries, has been suggested as treatment for an increasing variety of marine envenomation.[13] Cristiano *et al*. believed that infrared radiation is well absorbed by living organisms and is perceived as heat and their effects on living tissues are well known.[14]

Therefore, superficial, deep, and topical heat therapy using hot salt due to low cost, ease of use, and fewer side effects can be considered in the treatment of back pain, especially at home. The advantage of using hot salt as a form of halotherapy (Halo-therapy derived from the Greek alas, it means "salt," and it is a form of complementary medicine which makes use of salt) that later they will lose heat, and based on the sodium chloride formula, hot salt is an ionic compound and will have a reaction with the production of heat, light, and infrared radiation.[15] Furthermore, due to containing sodium chloride formula, hot salt is considered as an ionic composition which can have a reaction with the production of heat, light, and infrared radiation (sometimes called infrared, it is a region of the electromagnetic radiation spectrum). Heat can similarly lead to isthmic reduction and muscle spasm by increasing pain threshold through activating the spinal cord mechanisms and facilitating tissue repair and healing. The metabolic effects of these techniques are also due to increase of biological enzymatic reactions that can cause accelerated oxygen uptake and healing.[16,17]

French *et al*. concluded that the evidence bases to support the common practice of superficial heat for LBP is limited and there is a need for future higher quality randomized controlled trials. There is moderate evidence in a small number of trials that heat wrap therapy provides a small short-term reduction in pain and disability in a population with a mix of acute and subacute LBP, and the addition of exercise further reduces pain and improves function.[18] On the other hand, although applying hot stone therapy over the world is prevalent, few researches on hot stone therapy are available.[19]

Since the effects of hot salt and hot sand treatments as nonpharmacological procedures for pain relief in patients have not been investigated and compared yet, the effects of heat are extensively studied and they are widely used in physiotherapy and treatment of musculoskeletal pain, and review of the literature showed that there is more evidence in the use of hot salt as one of the complementary therapies, so in this study, researchers decided to compare the effects of hot sand therapy versus hot salt therapy on the perception of LBP as a hypothesis of this study. Therefore, the aim of the present study was to compare the effect of topical hot salt and hot sand on the perception of LBP in patients who were referred to the orthopedic clinic of an educational hospital in Shahrekord, Iran.

Materials and Methods

Study design and setting

In this quasi-experimental study, the patients with LBP referring to the orthopedic clinic of Shahrekord educational hospital were divided randomly into two interventions and one control group in 2020.

Study participants and sampling

Based on existing similar studies and sample size determination formula,[5,20] 30 people were randomly assigned to each group. The subjects were selected via convenience sampling method based on inclusion criteria and then assigned randomly to study groups based on the table of random numbers.[21-22] Inclusion criteria were having experienced LBP in the last 6 months ago, age of 20–70 years, willingness to participate in the study, and living in the center of the province and

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exclusion criteria were taking medications (such as chemical drugs, complementary, and herbal products) for musculoskeletal disorders, history of participation in exercise programs for the relief of LBP in the last 6 months, history of spinal surgery, and history of spinal-muscular congenital dystrophies and metabolic bone diseases such as osteoporosis and osteomalacia. After clarifying the research goals and obtaining the written consent before the intervention, patients completed the questionnaires (paper–pen method) and they have enough time to complete the distributed questionnaires. Moreover, the researcher reminded them that their participation was voluntarily and their information would remain confidential.

Data collection tool and technique

The questionnaires contained questions which are concerning demographic and McGill Pain Short Form Questionnaire (SF-MPQ) that consist of three parts: (1a) sensory experiences, (1b) affective experiences, (2) visual analog scale (VAS), and (3) present pain intensity scale (PPI). The first is a 15-point descriptor of average pain, with 11 points representing sensory experience (1a) and four affective experiences (1b). Each descriptor is rated on an intensity scale of 0–3, which is representing mild, moderate, or severe pain, with ranges of 0–33 (sensory) and 0–12 (affective). The sensory and effective pain level scores are added together to give a value for total pain experience (1c = 1a + 1b). The second part of the SF-MPQ (2) measures the PPI using a VAS from 0 to 100 with higher scores that are representing get the pain worse. The third part of the SF-MPQ (3) measures the PPI, only assessed lumbar back pain using a numerical pain rating from 0 (no pain) to 5 (excruciating pain). The SF-MPQ is free and available at https://www. esahq.org. For the short form (SF-MPQ), the participants were told that a set of pain descriptors was read loudly and participants would have to say if the word had explained their pain and if it did, how much severity of that particular quality of the pain is pronounced. The scale was placed in front of the participants and the researcher put checkmarks in the appropriate spaces. Participants marked the VAS.

The SF-MPQ is also known as a standard and valid tool that has been confirmed in several studies and the correlation coefficient (*r*) between this instrument and the SMILEY, as a screening tool to measure pain severity, has been reported 0.89.[16] In this study, split-half method was used to evaluate the reliability of this instrument. For this purpose, the instrument was administered to 20 nurses and Cronbach's alpha (*r*) was obtained 0.89.

After assigning the patients to one of three groups, the first intervention group received topical hot salt and naproxen cream (2 times a day) and routine physiotherapy, and the second intervention group was treated with topical hot sand, naproxen cream (2 times a day), and routine physiotherapy, and the control group only received routine treatments such as routine physiotherapy and naproxen cream; naproxen cream applied topically to the dry skin two times a day every several hours. The amount of applied gel for three groups is adjusted to the size of the region by complaints of the patient; most often, it is recommended to apply approximately 4 cm long strip of the gel. After the application, spread the gel over the affected area and massage gently until complete absorption. Both the intervention groups received the treatments as interventions once a day f 30 min for 1 week under the supervision of an orthopedist. Identical oilskin bags were used for applying topical heat by hot salt or hot sand, which were available in three sizes (small, medium, and large) for an optimum fit to the shapes of patient's bodies. The respective bags could contain 2.5 kg of salt or sand. These bags were then heated to the desired temperature of (40.0°C) in a hot air oven for 1 h, and after reaching to the optimum temperature according to the thermometer, the bags were removed from the device and after flattening the surface of the hot salt and hot sandbags, they were used for patients in each intervention group; respectively.

Before starting the topical heat therapy through hot salt and hot sandbags, the SF-MPQ was completed for rating LBP to determine its rates for patients in the two intervention groups and the one control group. The naproxen cream was also applied topically according to the instructions, and the bags of hot salt and hot sand were used to cover the area from the rib 12 to the lower gluteus when the patient was lying on the bed and the desired bag. The bags were placed in the bed and the patient laid down on them with at least one towel between to have a comfortable feeling of heat.

To prevent burns and skin damage, the required number of towels was used between the bags and the skin of the patient (usually one towel with the same thickness). For both intervention and controlled groups, immediately and 2 months after the topical use of hot salt, hot sand, naproxen cream, and routine physiotherapy, the SF-MPQ was recompleted by all the study subjects for rating LBP. In this study, the data were collected by questionnaires.

The obtained data from the self-report questionnaires after 2 months showed that by ≈ 90% of the patients, who were in the hot salt and hot sand group, performed the intervention regularly as instructed. In this regard, it is noted that all patients understudy were referred to the clinic weekly and received hot salt and hot sand protocol under the supervision of researchers.

The data were analyzed using SPSS software version 21(SPSS Inc., Chicago, IL, USA).

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Descriptive and inferential tests of variance repeated-measures analysis of variance (ANOVA) and Chi-square test were used with at a 5% significance level.

Ethical considerations

The study was approved by the Shahrekord University of Medical Sciences (the Research Project No. 2741 and the Ethics Code: IR.SKUMS.REC.1395-45). The researcher started the study after the research deputy of Shahrekord University of Medical Sciences was provided the formal permission to conduct the study. After the patients completed the consent form, they were ensured that the data are analyzed as confidential and anonymous and the findings are reported in general rather than as case specific.

Results

The normality of the data was confirmed by Kolmogorov–Smirnov test ($P > 0.05$). In demographic variables in terms of age, 46.7% of patients in the control group were <45 years old, in the hot sand group, 43.4% were <45 years old, and in the hot salt group, 43.4% were between 45 and 55 years old. In terms of sex, 56.6% of the patients in the control group, 60% of the patients in the hot sand group, and 60% of the patients in the hot salt group were male. In terms of marriage, 80% in the control group, 83.4% in the hot sand group, and 76.6% in the hot salt group were married. In terms of education level, 43.4% of patients in the control group, 43.4% of patients in the hot sand group, and 46.7% of patients in the hot salt group had higher than high school education. Regarding the history of the disease, 36.6% of patients <5 years of history of disease and 36.6% of patients between 5 and 10 years in the control group, in the hot sand group, 40% of patients between 5 and 10 years, and in the hot salt group, 40% between 5 and 10 years had a history of the disease. Statistical findings show that all three groups did not have a statistically significant difference in terms of sociodemographic variables at baseline between groups ($P > 0.05$) [Table 1].

Repeated measures of ANOVA showed that before the interventions, the mean difference of total pain experience score in all three groups was not significant ($P = 0.11$), but immediately after interventions, the mean difference of total pain experience score between the hot sand and hot salt intervention's and control group was significant ($P = 0.03$); in addition, 2 months after the intervention (follow-up), the mean difference of total pain experience score between the intervention and control groups was significant ($P = 0.02$). It should be noted that the mean total pain experience score in the hot salt group decreased from 13.9 ± 10.7 before the intervention to 5.2 ± 3.1 immediately after the intervention and 4.2 ± 2.1 2 months after the intervention. However, in the hot sand group, it decreased from 14.1 ± 11.3 before the intervention to 6.7 ± 4.2 immediately after the intervention and 5.6 ± 3.2 2 months after the intervention.

Repeated measures of ANOVA showed that before the interventions, mean differences for VAS between in hot salt, hot sand, and control groups were not significant ($P = 0.20$), but in the immediately after interventions, the mean difference of VAS score in the intervention's groups and control group was significant ($P = 0.03$); in addition, 2 months after the intervention (follow-up), the mean difference of VAS score in the intervention's and control group was significant ($P = 0.02$). Furthermore, the mean score of VAS in hot salt group decreased from 43.8 ± 21.6 before the intervention to 21.8 ± 14.5 immediately after and 17.5 ± 9.3) 2 months after the intervention; however, in the hot sand group, it decreased from 45.2 ± 22.7 before the intervention to 23.1 ± 11.9 immediately after and 20.1 ± 9.4 2 months after the intervention.

Repeated measures of ANOVA showed that before the interventions, the mean difference of PPI score in all three groups was not significant ($P = 0.1$), but in the immediately after interventions, the mean difference of PPI score in the intervention's groups and control group was significant ($P = 0.03$); in addition, 2 months after the intervention (follow-up), the mean difference of PPI score in the intervention's and control group was significant ($P = 0.02$). Furthermore, the mean score of PPI in the hot salt group decreased from 2.9 ± 1.9 before the intervention to 0.8 ± 0.2 immediately after the intervention and 0.6 ± 0.3 2 months after the intervention; however, in the hot sand group, it decreased from 2.9 ± 1.5 before the intervention to 1.4 ± 0.9 immediately after and 0.9 ± 0.4 2 months after the intervention.

So that, the effect of hot salt treatment immediately and 2 months after the intervention was more than the groups who were treated with hot sand on reducing LBP [Table 2].

Mean changes in LBP based on the SF-MPQ Scale over the course of the trial for hot salt, hot sand, and control groups in time stages and study groups are depicted in Figures 1-3.

Discussion

This study demonstrates clinically significant benefits of hot salt treatment and hot sand treatment in reducing LBP. The findings of this study show that the therapeutic effect of hot salt is significantly greater than hot sand in decreasing LBP.

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Table 1: Demographic characteristics of the samples in the study groups

Variable	Group	Scale	Number (Percentage)	Level of significance
Age	Control	less than 45 years old	14 (46.7%)	*P*=0.1
		46-55 years old	11 (36.7%)	
		56-65 years old	2 (6.6%)	
		66 years old and above	3 (10%)	
	Hot sand	less than 45 years old	12 (40%)	
	intervention	46-55 years old	13 (43.4%)	
		56-65 years old	4 (13.3%)	
		66 years old and above	1 (3.3%)	
	Hot salt	less than 45 years old	13 (43.4%)	
	intervention	46-55 years old	11 (36.6%)	
		56-65 years old	3 (10%)	
		66 years old and above	3 (10%)	
Marital status	Control	Single	6 (20%)	*P*=0.6
		Married	24 (80%)	
	Hot sand	Single	5 (16.6%)	
	intervention	Married	25 (83.4%)	
	Hot salt	Single	7 (23.4%)	
	intervention	Married	23 (76.6%)	
Education	Control	Ability to read and write	3 (10%)	*P*=0.2
		Below high school completion	6 (20%)	
		High school completion	8 (26.6%)	
		Higher than high school completion	13 (43.4%)	
	Hot sand	Ability to read and write	2 (6.6%)	
	intervention	Under high school completion	4 (13.4%)	
		High school completion	11 (36.6%)	
		Higher than high school completion	13 (43.4%)	
	Hot salt	Ability to read and write	2 (6.7%)	
	intervention	Under high school completion	2 (6.6%)	
		High school completion	14 (46.7%)	
		Higher than high school completion	12 (40%)	
Gender	Control	Female	13 (43.4%)	*P*=0.7
		Male	17 (56.6%)	
	Hot sand	Female	12 (40%)	
	intervention	Male	18 (60%)	
	Hot salt	Female	12 (40%)	
	intervention	Male	18 (60%)	
History of disease (year)	Control	less than 5 years	11 (36.7%)	*P*=0.3
		5-10 years	11 (36.6%)	
		10-15 years	5 (16.7%)	
		more than 15 years	3 (10%)	
	Hot sand	less than 5 years	10 (33.4%)	
	intervention	5-10 years	12 (40%)	
		10-15 years	4 (13.3%)	
		more than 15 years	4 (13.3%)	
	Hot salt	less than 5 years	9 (30%)	
	intervention	5-10 years	12 (40%)	
		10-15 years	6 (20%)	
		more than 15 years	3 (10%)	

Demographic findings showed that the rates of pain in female and married men aged 55–65 years with a less than 5 years' history of LBP were more. In this respect, the findings of the systematic review study by Traeger *et al*. showed that the mean age of patients with LBP was <47 years and about 55% of the samples were women.[23] Shmagel *et al*., in their study, showed that chronic LBP associations with adjusted odds ratios ≥2 included age 50–69 years, less than high school education, annual household income <$20,000, income from disability, depression, sleep disturbances, and medical comorbidities.[24]

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Table 2: Change trends in mean rates of low back pain in three study groups at three times before, immediately after, and two months after the study

Measure	Time	Hot Sand (Mean±SD)	Hot Salt (Mean±SD)	Control (Mean±SD)	*P*
Total pain experience	Before intervention	(14.1±11.3)	(13.9±10.7)	(13.7±10.1)	0.11
	Immediately after intervention	(6.7±4.2)	(5.2±3.1)	(13.9±9.8)	0.03
	Two months after intervention	(5.6±3.27)	(4.21±2.14)	(13.8±10.4)	0.02
Visual Analogue Scale (VAS)	Before intervention	(45.29±22.73)	(43.81±21.06)	(40.2±21.17)	0.48
	Immediately after intervention	(23.15±11.94)	(21.88±14.56)	(39.39±20.74)	0.03
	Two months after intervention	(20.18±9.47)	(17.58±9.37)	(39.76±21.29)	0.01
PPI	Before intervention	(2.9±1.53)	(2.9±1.9)	(2.8±1.04)	0.20
	Immediately after intervention	(1.44±0.99)	(0.83±0.21)	(2.75±1.11)	0.03
	Two months after intervention	(0.95±0.4)	(0.69±0.36)	(2.81±1.09)	0.02

Present pain intensity (PPI)

In this regard, Jana and Paul concluded that in India, near about 8% of people's years lived with disability due to low back problem and 4.6% of people disability-adjusted life years (DALYs) in musculoskeletal disorder. The rate of change DALYs in respect of LBP has been 1.2% to 2.3% between the years 1990 and 2016.[25]

Mattiuzzi *et al*. in their studies believed that the current estimates of incidence, prevalence, and DALYs of LBPs are 245.9 million cases/year (3.2%; 15th worldwide cause), 577.0 million cases (7.6%; 15th worldwide cause), and 64.9 million DALYs (2.6% of all DALYs; 6th worldwide cause), respectively. All these measures displayed a considerable ~ 50% increase during the last 20 years. The burden of all LBP cases is marginally higher in women than in men, reaching the peak between 40 and 50 years, and then progressively declining. An analysis within each age range shows that the prevalence of LBP among all human diseases grows in parallel with aging, with the most notable increase after 80 years.[26]

In fact, the levels of LBP in Iran are different than in the world, while LBP is higher in male than female and also the mean age of individuals with LBP is higher than the global standards.

As well, our findings demonstrated that the mean score of LBP at different times after intervention in each study group had significant differences with each other in a way that the two intervention groups (hot salt and hot sand) showed much more reduction in LBP during the study compared with the controlled group. The hot salt treatment had been able to moderate the rates of pain during the 2 months compared with the control group. So that, the effect of hot salt treatment on reducing LBP in the study subjects immediately and 2 months after the intervention was more than the group who was treated with hot sand. Regarding the usage of nonpharmaceutical procedures to relieve back pain which were consistent with the findings of this study, the results of Zargarzadeh *et al*.'s study on patients with intervertebral disc disease suggesting that techniques such as progressive muscle relaxation could reduce the mean score of LBP and in consequent increase the dimensions of daily life activities after 2 months of intervention compared with the controlled group.[27] Furthermore, the results of Baird *et al*. study showed lower rates of pain in individuals who were suffering from osteoarthritis after 12 weeks using progressive muscle relaxation.[28] Paige *et al*.'s study evaluated the relationship between spinal manipulative therapy and its clinical advantages and disadvantages in acute LBP, it has been shown that the spinal manipulative therapy could have a positive effect on the improvement and modulation of pain, as well as function of the musculoskeletal system although it only caused short and transient disorders in the musculoskeletal system.[29] In fact, using nonpharmacological treatments can have lower side effects with beneficial impacts on the improvement of LBP which is an advantage over other therapies, such as medical treatments.[12,30,31] The topical application of hot salt and hot sand in the present study accounted for a positive significant effect on reducing LBP, and using of these therapeutic procedures was recommended.

The results indicated that during the study, the mean rates of LBP in the group who was treated with topical hot sand were less than the controlled group which was similar to the findings of Robinson *et al*.'s study about the effectiveness of techniques such as doing William flexion exercises in the treatment and the relief of LBP.[32] Other studies also revealed increased power, dynamicity of pelvis belts, and improved performance in individuals who are suffering from chronic back pain after doing William flexion exercises.[31]

In this study, the group who was received hot salt treatment showed a greater decrease in pain compared with the group who was treated with hot sand. Hence, the average rates of LBP immediately and 2 months after the intervention in the group receiving hot salt treatment were less than the group treated with hot sand. Given the increase in time from the onset of the intervention, the level of lower back pain also reduced further and the topical use of hot salt was generally more effective

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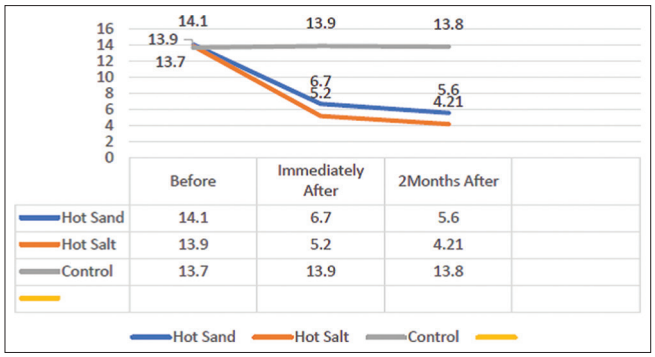

Figure 1: Comparison of mean low back pain score in total pain experience in time stages and study groups. Shows that the mean score of total pain experience before the interventions was not significantly different, but immediately after the hot salt and hot sand interventions and 2 months later, this difference was significant

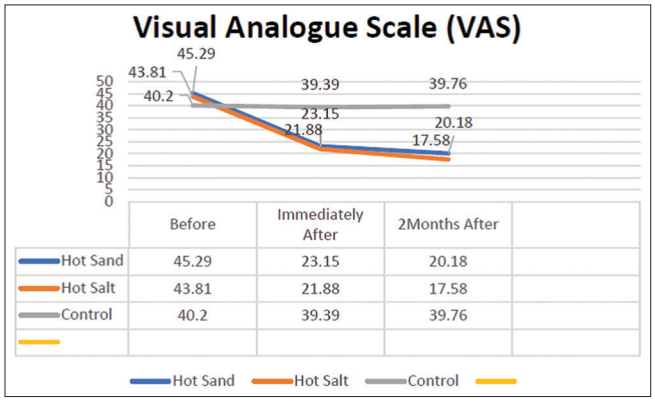

Figure 2: Comparison of mean low back pain score in visual analog scale in time stages and study groups. Shows that the mean score of visual analog scale before the interventions was not significantly different, but immediately after the hot salt and hot sand interventions and 2 months later, this difference was significant

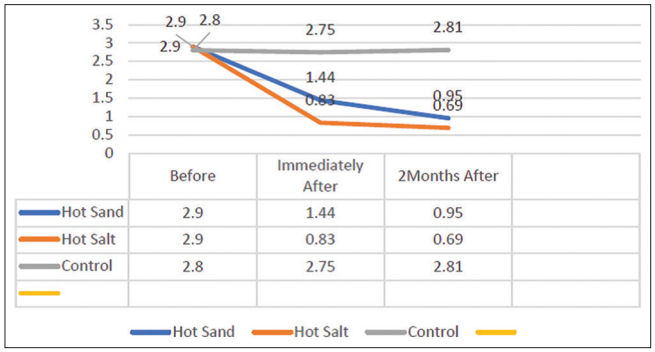

Figure 3: Comparison of present pain intensity score in time stages and study groups. Shows that the mean score of present pain intensity before the interventions was not significantly different, but immediately after the hot salt and hot sand interventions and 2 months later, this difference was significant

than the hot sand technique in terms of moderating LBP. Highlighting the importance of the topical function of halotherapy because of its strong scientific documentation and evidence, Chervinskaya considered the effectiveness of this procedure due to the following reasons of its scientific basis, capacity to be implemented at different levels, and ultimately, broad clinical applications and confirmation of its medical effects in the literature such as its use in the fields of pulmonology, allergology, pediatrics, otorhinolaryngology, and dermatology. For this purpose, the present study also validated the positive and implausible effects of halotherapy in the treatment of LBP.[33]

The results of Quinn *et al*. study showed that the response of the studied samples to reflexology techniques was equal to 49.6% and the response of the studied samples to the relief of LBP after receiving reflexology techniques was equal to 94.3%.[30] In fact, reflexology had been confirmed as a nonpharmacological and complementary treatment of LBP and the results of using of reflexology in this study were in line with the findings of the effects of halotherapy and hot sand treatment. Therefore, it was concluded that nonpharmaceutical therapies for the improvement of patients with LBP should be always taken into consideration by health-care providers.

Besides, the comparison of the process of reducing the amount of back pain in the study subjects showed that in both the groups who were receiving hot salt and hot sand treatments, the rates of lower back pain had reduced due to the increased duration of using these techniques. Seers *et al*. in their study suggested that massage therapy for 15 min could significantly reduce the level of pain and patient's anxiety in two intervention groups within two time periods, i.e. immediately and 1 h after massage.[34] Posadzki *et al*. also in a study found that using this type of massage therapy could significantly moderate pain more than before the intervention stage. The results also showed that during the first to fourth massage sessions, the pain significantly decreased after the completion of massage sessions.[35]

Another application of heat in the treatment of musculoskeletal disorders such as LBP is the use of mud therapy. In this regard, mud has been used empirically in musculoskeletal and inflammatory joint diseases. Chadzopulu *et al*. believed that mud-pack application alone or in combination with balneotherapy has been found to be effective in painful arthritic processes. It has been shown to induce anti-inflammatory activity and influence the antioxidant system in patients with osteoarthritis.[36]

Continued treatment with nonpharmacological follow-ups was among the other findings of this study and it should be always emphasized that follow-up and continuation of treatment can be added to the effectiveness and efficiency of such treatments. According to the findings of this study, it was concluded that both the procedures could be effective in reducing the level of LBP, but the improvement of the LBP as a

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result of treatment with hot salt was more effective than that with topical hot sand in terms of reducing the rates of LBP in the studied samples.

Hot sand intervention and hot salt intervention are promising nonpharmacologic techniques for treatment of LBP. However, more rigorous trials must be undertaken to convincingly demonstrate their effectiveness. It is noted that the participants of this study were received hot sand and hot salt intervention at the outpatient clinic and in this regard, the continuation of treatment which is considering its 1-week efficacy in the home care atmosphere could also increase the effectiveness and efficiency of the interventions.

Limitations and recommendation

The present study has a number of limitations. First of all, patients were not able to report their condition after an intervention and second, the sample size of this study was small and we suggested that further studies will be designed with larger sample sizes.

Conclusions

The findings have revealed that the topical treatments with hot salt and hot sand could have a significant effect on the perception of LBP compared to those in the control group, whereas hot salt might be stronger effects than hot sand on reducing LBP.

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Conflicts of interest

There are no conflicts of interest.

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