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Comparison of the effects of acupressure and ıce massage in primary dysmenorrhea: A randomized controlled trial

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Abstract

The aim of the study was to compare the effectiveness of acupressure and ice massage treatment methods in the treatment of primary dysmenorrhea. The 210 female students were randomly divided into three groups: acupressure, ice massage and control. In the acupressure group, pressure was performed at the Hugo point by applying medium pressure for 10 minutes of massage. The procedure was repeated five times. In the ice massage group, 2 cm diameter circular ice pieces were used. Massage with ice was carried out rotationally for 10 minutes. Like the acupressure, the procedure was repeated five times. In the control group, glass marbles were applied at the Hugo point with no pressure and massage for 10 minutes. The intensity of pain was measured prior to the intervention, during the intervention and following the intervention using a visual analogue scale. In the beginning, the mean VAS scores were 7.41 ± 1.82, 6.74 ± 2.23, and 7.03 ± 1.72 in the participants in groups control, acupressure and ice massage, respectively (P = 0.13). After the intervention, the mean pain scores were significantly lower at all of the time points in groups acupressure and ice massage than in group control participants (P < 0.001). Although the pain scores showed a more decreasing trend after the intervention in group ice massage than that in group acupressure, the difference between the two groups was not statistically significant (P = 0.97). It was revealed that treatment with acupressure and ice massage could also be recommended as a complementary medicine treatment for the treatment of primary dysmenorrhea with no reported side effects.

Keywords: acupressure, ice massage, Hugo point, dysmenorrhea, pain

1. Introduction

Dysmenorrhea is the most prevalent gynecologic ailment affecting women and is characterized by uncomfortable menstruation. Because of the many definitions and approaches utilized, determining the exact prevalence rate of dysmenorrhea is challenging. The prevalence of the disease has been reported to range from 17% to 90% (1). In adolescents and young adults, the prevalence of dysmenorrhea is estimated to be between 34% and 94% (2).

A recent comprehensive analysis of persistent pelvic discomfort shows that dysmenorrhea affects 17 per cent to 80 per cent of women (3). According to research done in various locations using various approaches, more than 70% of Iranian females suffer from dysmenorrhea (4, 5). Some women have minor discomfort during their menses, while others have major limitations in their ability to operate. Lower abdomen and back pain are the signs most toughly related to absences from or impaired effectiveness at work and school among all menstrual-related complaints.

Up to 15% of women with dysmenorrhea have symptoms severe enough to keep them from going to work, school, or other activities (6, 7). Flexibility in hours or the option to work from home may help to alleviate this issue. Still, even for females who do not miss work or school due to menstrual-related symptoms, the diminished attention and productivity that comes with them significantly impact performance (8). The presence or absence of an underlying cause determines whether dysmenorrhea is classed as primary or secondary (9). Primary dysmenorrhea is discomfort associated with menstruation with no underlying cause, and endometriosis leiomyomas, pelvic inflammatory disease, and interstitial cystitis are all examples of secondary dysmenorrhea (10).

The majority of unpleasant menses in ovulatory women are caused by primary dysmenorrhea. The discomfort associated with primary dysmenorrhea might be minor or severe. It is generally stronger on the first day of menstruation and progressively fades. The pathogenesis of primary

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dysmenorrhea is unknown; however, one of the most widely acknowledged explanations is the production of prostaglandins and other inflammatory substances from the endometrium during menstruation, such as Leukotriene (11-13).

Today, a variety of treatments for controlling menstruation pain are employed, mostly grouped into two categories: medical and non-medical procedures. Although medications have immediate effects, long-term usage might result in nausea, digestive issues, peptic ulcers, and diarrhea. Furthermore, these medications are ineffective in 10-20% of patients (12). As a result, non-medical treatments known as complementary therapies have recently gained popularity among patients. These procedures are easy, low-cost, and non-invasive, with no adverse side effects (14, 15).

Acupressure is a well-known complementary and alternative medicine technique used worldwide. It is based on stimulating acupoints along meridians as a basic premise. Acupoint activation is aided by using fingers or a variety of readily accessible hand-held acupressure devices (16). Muscle tension is relieved with acupressure by applying pressure to specific acupoints with the hand or with the thumbs on particular points or by applying pressure to acupoints to balance the flow of physiological energy (17, 18). Acupressure demands applying physical pressure on trigger points/acupoints/specific pressure points located along the meridians. Meridians are the channels within the human body that aid in the maintenance of Qi and, as a result, the stability of one's health. Acupressure is a non-invasive, needle-free, cost-effective, and non-pharmacological curative method that is performed manually. Acupressure's biochemical process (Fig. 1) includes the stimulation of acupoints, which results in complicated neuro-hormonal reactions (19). It results from a negative feedback loop between the hypothalamus and pituitary-adrenocortical axis, which causes cortisol overproduction and relaxation response (20). It also affects physiological responses by enhancing endorphin and serotonin transmission through nerves and meridians to the brain and particular organs (21).

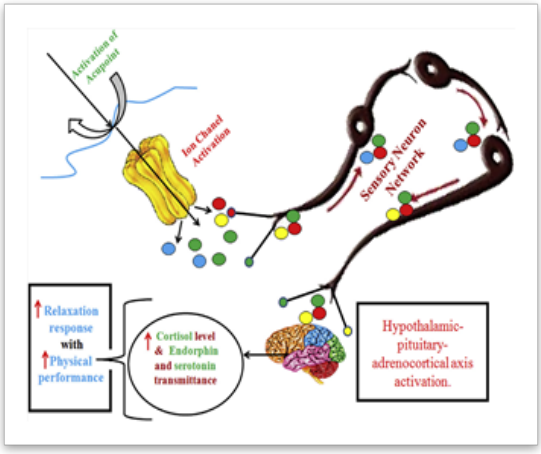

Fig. 1. Biochemical mechanism of acupressure

The large intestine or Hugo point (LI4) is the body's greatest significant pain reliever point (22). Hugo point is the center of the angle between the bones of the first and second fingers of the hand between the thumb and the pointer on the back of the hand, which is the subject of this research. The energy flow is closer to the skin surface at this location, which may be easily triggered by pressure, needles, or intense cold (23). Figure 2 depicts the exact location of Hugo point.

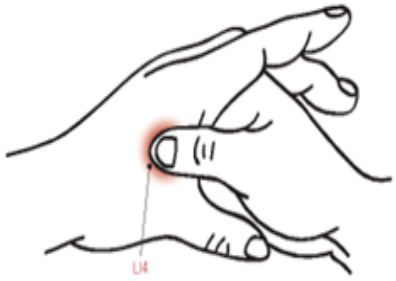

Fig. 2. position of Hugo point (Li4)

Numerous researches have revealed different acupressure effects; among them, the impact of acupressure on dysmenorrhea is the most usually quoted one (24). Furthermore, data shows that acupressure has aided in the relief of pain in a variety of situations. According to Chang and Hang's investigation findings, acupressure at the Hugo point can reduce pain instantly, half an hour later, and an hour afterwards (25). Hugo Point massage was also employed in the Sultanpour et al. research to reduce discomfort produced by inserting a needle into the artery-venous fistula in hemodialysis patients (25). Furthermore, the study proposes that cold efficiently slows nerve conduction rate and blocks nerve impulses and communication in the sensory fibres (26). Hugo point ice massage may be a simple and cost-effective pain-relieving alternative for patients since it is simple to administer by nurses and has few adverse effects (27).

Furthermore, studies have shown that Hugo point ice massage helps relieve pain (28). Shahdadi et al. found that ice massage may be used to reduce primary menstruation pain since it is a non-invasive, easy, and economical approach with no side effects that can be taught in the minimum amount of time (29). Both acupressure and ice massage treatments decreased pain severity, labour stage length, and anxiety level in primipara women, according to research by Kaviani et al.; however, the benefit of ice massage was more significant (30).

Melzak investigated the ice massage effect at the LI4 point on toothache in forty outpatients referred to a dental clinic in Montreal and found that both massage and ice massage on the LI4 point significantly reduced the intensity of toothache in the participants; however, the ice massage group experienced a greater reduction in pain intensity than the massage group (31).

Given the potential effect of dysmenorrhea and its signs

on young women's academic performance at a critical stage in their lives, and because ice massage and acupressure are simple and low-priced approaches, as well as the restricted number of studies performed in this area, the current study compared the effects of acupressure and ice massage on Hugo point (LI4) pain to relieve dysmenorrhea pain.

2. Material and Methods

2.1. Study design and sample size

This study was a prospective, single-blind randomized clinical trial conducted on female students at Sirjan University of Medical Sciences from February 2021 to April 2021. The study population was the entirety of female students who fulfilled all inclusion criteria. The inclusion criteria were age between 18-32; willingness to cooperate; experience of painful menstruation in previous cycles; regular menstrual cycle; not suffering from diseases such as hormonal disorders, heart disease, thyroid, diabetes, asthma, kidney disease, pregnancy, polycystic ovary; no history of taking drugs such as corticosteroids, painkillers, contraceptives. Also, exclusion criteria were interval between menarche (first menstruation in women) less than six months, history of coagulation disorders, cognitive disorders, and mental illness. The sample size was determined using convenience sampling. A pilot study with 48 people was performed using permutated block randomization method to determine the sample size. Individuals were randomly divided into three groups: control, acupressure and ice therapy (8 blocks of 6). Considering the mean and standard deviation (SD) of pain intensity scores before, during and after the intervention in two groups of acupressure and ice therapy (dBefore = 0.86 [SD = 1.78], dNow=1.20 [SD=1.87], dAfter=0.60 [SD=1.53]), the final sample size was calculated using NCSS software at a significance level of 0.05 and a power 80% of 210 people (70 people in each group).

2.2. Data collection and instruments

After receiving informed consent to participate in the study, the admitted patients who met the study's inclusion criteria were considered the study's sample. Prior to signing the written consent form, all participants were assured of the confidentiality of their information and the ability to leave the study at any time with no repercussions. To prevent discrepancies, the researchers ensured that all treatments were executed correctly and that all individuals received equivalent pressure at the Hugo point. The researchers also performed the required intervention while adhering to all health procedures.

A demographic questionnaire was one of the data gathering tools comprised of age, length of menstrual period, the field of study, duration of the first menstrual period, degree of birth, etc.

The visual analogue scale was used to determine the severity of the pain (VAS), which is a commonly used pain measuring tool. A patient is asked to estimate the severity of her pain along a horizontal line of 100 mm (most typically), and the rating is then measured from the left edge (=VAS score). Although the VAS score strongly correlates with acute pain levels, it is 20 mm inaccurate (32). The tool's reliability and validity have been endorsed by Shaban et al. in Iran (33). Bijour et al. declared a correlation coefficient of 0.97 with a confidence range of 0.96 to 0.98 in a research to assess the reliability of visual acuity instruments of patients sent to the Emergency unit that were appropriately reliable to measure the pain (34).

In the current study, an acupuncturist offered crucial commands on finding the pressure point, applying pressure, the quantity of pressure, and other related issues. We maintained emotional, verbal, and nonverbal communication with the subjects throughout the study and provided psychological support. The acupressure group received a 5-minute regular and rotational massage. Initially, a 60-second massage was given without regard to contractions (30 seconds clockwise and 30 seconds counterclockwise). After that, the patient had a 10-second break. This method was repeated until the 5-minute massage time was up. The pressure exerted by the research assistant's fingers was assessed using a digital weighing scale with a 1 g accuracy before the intervention. The point was subjected to a mean pressure of 1.5 to 3.5 kg. To administer ice massage, the researcher utilized circular ice chunks with a diameter of 2 cm inside plastic bags and wrapped with a thin gauze to avoid moisture transfer and direct ice contact with the skin. Massage with ice was done rotationally for one minute (30 seconds clockwise and 30 seconds counterclockwise). Like the acupressure, the procedure was repeated five times with a time-lapse of 10 seconds. No intervention was done in the control group; the patients received routine care, and the ice ball spun outside the Hugo point. The pain severity was recorded before, immediately, and one hour after intervention in the three groups.

2.3. Statistical analysis

Categorical and continuous variables were presented as the numbers (per cent), median (interquartile range) and mean (standard deviation), respectively. The independent t-test, one-way ANOVA, and repeated measures ANOVA were used to analyze the data in SPSS V. 19, with the significance level set at 0.05 in all tests.

2.4. Protocol to perform validation of electronic visual analog scale

Before beginning the procedure, participants were given a quick interview to check if they fulfilled the selection criteria and to enquire about their personal information. The researcher explained the procedure, and participants signed the informed consent form after reading the information page. For the application of pressure, participants were directed to draw a short vertical line on the paper's horizontal line to record their discomfort, with the left end representing no pain and the right end being the most severe suffering conceivable.

To improve dependability, the procedure (paper) was repeated twice, with a minimum of 5 minutes between tries. To establish a more uniform and reproducible system that could be easily employed in a clinical context, the authors elected not to randomize the initial device for evaluating pain; furthermore, the possibility of a sequence effect was previously confirmed using panel data regression in a random sample of similarly sequenced individuals, but no such effect was observed. Any earlier recordings were erased to avoid biasing the patient's pointing. Participants were not allowed to view the paper while pointing to the next one and were not notified of their results until the procedure was completed.

3. Results

This study was performed on 210 participants in three groups of 70 individuals with control, acupressure, and ice massage. The mean (SD) age of subjects was 23.0 (3.2), in ranges of 18-32 years. Most participants were single (75.7%) and with an Associate s' degree (53.4%). There was no significant difference between these three groups in terms of their demographic characteristics using one-way ANOVA, Chi-Square, or Fisher's Exact Test ($p > 0.05$) (Table 1).

Table 1. Respondents' demographics and characteristics

Variable		Control (n=70)	Acupressure (n=70)	Ice massage (n=70)	*P*-value*
Age, Mean ± SD		22.0 ± 2.4	22.3 ± 2.9	22.7 ± 2.8	**0.73**
BMI, Mean ± SD		21.3 ± 2.03	22.7 ± 3.5	22.0 ± 2.6	**0.58**
Marriage, n (%)	Single	58 (82.9)	49 (70.0)	53 (75.7)	**0.20**
	Married	12 (17.1)	21 (30.0)	17 (24.3)	
Education, n (%)	Associate	39 (58.2)	32 (47.1)	39 (58.2)	**0.32**
	Bachelor s' degree	28 (41.8)	36 (52.9)	28 (41.8)	
Underlying disease in student, n/N (%)	Kidney	-	1/10 (10.0)	-	**0.98**
	Liver	-	-	1/13 (7.7)	
	Thyroid	5/9 (55.6)	4/10 (40.0)	8/13 (61.5)	
	Mental	1/9 (11.1)	2/10 (20.0)	1/13 (7.7)	
	Migraine	2/9 (22.2)	2/10 (20.0)	2/13 (15.4)	
	Respiratory	1/9 (11.1)	1/10 (10.0)	1/13 (7.7)	
Obesity in relatives, n/N (%)	Grade1	22/26 (84.6)	21/29 (72.4)	22/27 (81.5)	**0.51**
	Grade2	4/26 (15.4)	4/26 (15.4)	5/27 (18.5)	
History of underlying disease in relatives, n/N (%)	Grade1	22/26 (84.6)	22/26 (84.6)	20/23 (87.0)	**0.97**
	Grade2	4/26 (15.4)	4/26 (15.4)	3/23 (13.0)	
Activity, n (%)	Normal	30 (42.9)	29 (41.4)	28 (40.0)	**0.57**
	Light	33 (47.1)	28 (40.0)	34 (48.6)	
	Professional	7 (10.0)	13 (18.6)	8 (11.4)	
Nutrition, n/N (%)	Low Salt	3/5 (60.0)	11/16 (68.7)	3/5 (60.0)	**0.99**
	Vegetable	2/5 (40.0)	5/16 (31.3)	2/5 (40.0)	
Disorder, n/N (%)	Depress	47/67 (70.1)	43/67 (64.2)	42/68 (61.8)	**0.57**
	Angry	20/67 (29.9)	24/67 (35.8)	26/68 (38.2)	
To take action, n (%)	Drug	45(64.3)	37 (52.8)	43 (61.4)	**0.79**
	Imam	8 (11.4)	9 (12.9)	8 (11.4)	
	Rest	13 (18.6)	15 (21.4)	13 (18.6)	
	No work	4 (5.7)	9 (12.9)	6 (8.6)	

*P-Values were calculated by One-way ANOVA, χ^2 or Fisher's Exact Test.

Table 2 presents the mean (SD) of pain intensity scores before, during and after the intervention for the control group, acupressure and ice massage. In all dimensions, the score reduction in the acupressure and ice massage groups was greater than in the control group. However, One-way ANOVA demonstrated that the difference between the mean scores of the three groups was significant only in post-test ($p < 0.001$) and follow-up ($p < 0.001$).

According to Repeated Measure ANOVA, the mean scores of pain intensity in the two groups of acupressure ($p < 0.001$) and ice massage ($p < 0.001$) had significant changes over time.

In the Acupressure group and based on Bonferroni Post Hoc, this difference was significant between all times, before and during ($p < 0.001$), before and follow-up ($p < 0.001$), and during and follow-up ($p < 0.001$).

In the Ice massage group and based on Bonferroni Post Hoc, this difference was observed between all times before and during ($p < 0.001$), before and follow-up ($p < 0.001$), and during and follow-up ($p = 0.012$). However, in the control group, the mean scores changed very little over time ($p = 0.220$). The Repeated Measure ANOVA test results also showed significant changes in the mean pain intensity reduction in the three groups during the study ($p < 0.001$). The results of repeated measures analysis of variance also showed that the mean pain intensity scores differed in the three control groups, acupressure and ice massage ($F = 21.503$, $p < 0.001$). Tukey test showed this difference significantly only between control and acupressure groups ($p < 0.001$) and control groups and ice massage ($p < 0.001$). It is north worthy that this difference was not significant between the two groups of acupressure and ice massage ($p = 0.97$).

Table 2. Comparison of mean pain intensity score in three groups of control, acupressure and ice therapy over time

Pain intensity	Total n=210 Mean ± SD Median (IQR[a])	Control n=70 Mean ± SD Median (IQR)	Acupressure n=70 Mean ± SD Median (IQR)	Ice massage n=70 Mean ± SD Median (IQR)	Comparison of three groups (Between groups) (One-way ANOVA)
Pre test	7.06 ±1.95 7 (6. 9)	7.41 ± 1.82 8 (6.9)	6.74 ± 2.23 7 (5. 8)	7.03 ± 1.72 7 (6.8)	**F = 2.06, p = 0.13**
Post test	6.31 ± 2.05 6 (5. 8)	7.58 ± 1.67 8 (7. 9)	5.74 ± 2.09 6 (4, 7.5)	5.61 ± 1.75 5 (4.7)	**F = 19.32, p < 0.001**
Follow-up	6.06 ± 2.19 6 (4. 8)	7.60 ± 1.65 8 (7. 10)	5.17 ± 2.10 5 (4. 7)	5.21 ± 1.69 5 (4. 6)	**F = 32.01, p < 0.001**
Compare the before, now and after (Within groups) (Repeated Measure ANOVA test)		F = 1.51 p = 0.22	F = 43.15 p < 0.001	F = 60.34 p < 0.001	
Time × Group*	F = 36.96, p < 0.001				

[a]Inter quartile range*Repeated Measure ANOVA test.

4. Discussion

Primary dysmenorrhea is pain that occurs during the menstrual cycle without a known reason. It's one of the main reasons for pelvic pain in females, and it can make daily tasks difficult (1). There are a variety of therapeutic options available, many of which have acceptable efficiency and safety profiles.

Different methods are used to control menstrual pain today, which are mainly divided into two categories of medical and non-medical techniques. The recommendations reflect a balance between the available evidence and an assessment of benefit, harm, and cost. Nonsteroidal anti-inflammatory drugs, oral hormonal medications and other analgesics are among the medical treatments (35). Although these drugs have quick effects, their long-term use can cause problems such as nausea, digestive problems, peptic ulcer and diarrhea (36). Also, these drugs are not helpful in 10-20% of patients (37).

Effective dysmenorrhea treatment necessitates a discussion of risks, advantages, and alternatives, with a particular emphasis on finding a treatment method that matches the patient's goals in the context of her lifestyle and other medical problems. In recent years, patients have become more interested in non-medical treatments, sometimes known as complementary therapies. These methods are easy, low-cost, and non-invasive, with no adverse side effects (15, 38).

Regarding non-pharmacological treatment options for dysmenorrhea, by conducting a review of physical therapy treatments in dysmenorrhea, a study pointed out that thermotherapy, either by cold or heat, is a systematic treatment for that dysfunction. The authors added that both could eliminate or reduce pain practically and economically (39).

The goal of this study was to compare the effects of two types of acupressure and ice massage on the degree of dysmenorrhea pain at the Hugo point. Our findings demonstrated that the acupressure and ice massage groups experienced higher pain reduction than the control group. Furthermore, the findings revealed that the difference in mean scores between the three groups was significant only in the post-test and follow-up periods. The outcomes of the current study are in line with those of other studies in this field. For example, Wahdi et al. (40) revealed that applying acupressure to the Hugo point can reduce the severity of menstruation pain (41). The efficacy of different acupuncture times for primary dysmenorrhea was explored, and it was concluded that acupuncture has a favorable effect on alleviating primary dysmenorrhea pain (30). Both acupressure and ice massage approaches were found to lower pain severity, labour stage duration, and anxiety in primipara women. Furthermore, Bastani et al., when looking at the effect of acupressure on the Hugo point on the pain induced by the removal of a chest tube in cardiac patients, discovered that acupressure lessened the agony (42).

These outcomes are consistent with the results of Rostami et al., that investigated the effect of acupressure at the LI4 point on labour satisfaction in women and found that the intervention and control groups' satisfaction levels were significantly different, with participants in the intervention group scoring the greatest in terms of treatment satisfaction (27). This finding is consistent with the findings of other investigations. For example, the results of the Khalili-Shomia et al. demonstrated that cold massage at Hugo site alleviated post-appendectomy pain in patients, which is consistent with the findings of this study (25).

Rakhshekhorshid et al. compared the massage and ice massage impact on SP6 on primary dysmenorrhea's duration and severity and found that using acupressure at SP6 with or without ice significantly decreased the duration and severity of primary dysmenorrhea in the intervention group in comparison to the control group (43). A study by Barani et al. revealed that ice massage could be used to reduce primary menstrual pain as a non-invasive, simple, and economical method with no side effects, considering the feasibility of training it in the shortest time, which is consistent with the findings of this study (29).

The results of Aeen et al. revealed that the mean pain intensity in the Hugo point massage with ice group and the control group was considerably lower than in the Hugo point massage without ice group (44). After the intervention, the Hugo point massage with ice group had a considerably lower mean anxiety score than in the ice-free massage group ($p = 0.040$) and in the control group. The results of Al-Najjar et al. indicated that adding ice massage to a short-term treatment reduces pain, improves pain threshold and function, and increases side bending of the cervical area in participants with mechanical neck pain and activated trigger points in the upper trapezius muscle, with no statistically significant difference (45).

Supporting the results of the present study, Howatson et al. demonstrated that cold massage was unsuccessful in lowering the indirect indicators linked with an exercise-induced muscle injury, according to the study (46). Furthermore, MacAuley et al., in a comprehensive assessment of the evidence for cryotherapy in acute soft tissue injuries treatment, discovered that ice with exercise was the most beneficial after an ankle sprain and following surgery (47).

Based on the findings, it can be concluded that acupressure and ice massage can be effective therapy for treating primary dysmenorrhea that is simple to administer and does not require any specific equipment. These approaches are also advised for persons who find that taking analgesics is damaging to them, those who suffer from these medications' adverse effects, and those who are hesitant to use the drugs. As a result, acupressure and cold massage are indicated in individuals with primary dysmenorrhea. Furthermore, there were no unfavourable side effects associated with the administration. These data suggest that acupressure and cold massage can be used as a safe therapy for primary dysmenorrhea, particularly in severe instances. The application of cold massage and acupressure at Hugo point considerably decreased the degree of discomfort in primary dysmenorrhea, according to the findings of this study.

This study has a number of potential limits that should be considered. Pain perception, pain threshold, financial and psychological status, and social and cultural backgrounds may have varied among our participants. All patients were chosen from the same geographic location to control the confounding influence of social and cultural variety in our sample. To ensure that all patients received the same level of care, they were all admitted to the same ward and cared for by the same nursing team. However, we need to replicate our findings.

Ethics Committee Approval

The study was conducted with permission from the deputy of medical research and approval from the ethics board of Sirjan University of Medical Sciences (code number: IR.SIRUMS.REC.1399.029). This study is also listed in the Iranian Clinical Trials Registry (code number: IRCT20200624047911N1) on 2021.02.05.

The authors are responsible for all aspects of the work, including ensuring that any questions about the work's accuracy or integrity are thoroughly explored and resolved.

Authors' contributions

The conception and design of the study: Naimeh Pourramezani; Acquisition of data: Moazameh Sadat Razavi-Nasab; Analysis and interpretation of data: Mohadeseh Balvardi; writing the article or revising it for significant intellectual content: Fatemeh Alavi-Arjas, Maryam Firouzabadi, Moazameh Sadat Razavi-Nasab; Final approval of the version to be submitted: Naimeh Pourramezani.

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Conflict of interest

There are no conflicts of interest.

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