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Volume: 3 Issue: 2
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Publisher
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CONTENTS

ORIGINAL RESEARCHES

CASE REPORT

REVIEWS

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1040648

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ORIGINAL RESEARCH

Approximately Three Years of Prolotherapy Experience of a Traditional and Complementary Medicine Center: An Epidemiologic Study

Ilker SOLMAZ[1], Aydan ORSCELIK[2*]

[1]Department of Anesthesia and Reanimation, Health Sciences University Gulhane Training and Research Hospital, Traditional and Complementary Medicine Practice Center Ankara, Türkiye
[2]Department of Sports Medicine, Health Sciences University Gulhane Medical Faculty, Ankara, Türkiye

* Corresponding Author: Aydan Orscelik, e-mail: aydanozcan@yahoo.com

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Abstract
Objective: Prolotherapy is a regenerative injection-based treatment which is increasingly using in musculoskeletal disorders. There are studies about the usage of prolotherapy in diseases but there is not an epidemiological study in the literature. The aim of this study is to resolve the lack of epidemiological studies about prolotherapy.
Materials-Methods: Ten-thousand-three-hundred-nineteen patients who were applied to our outpatient clinic between January 1, 2017 and 2021 were included in the study.
Results: The number of patients' injured area was 10319 with the mean age of 54.2±13.8. 2886 male (28.0%) and 7433 females (72.0%) were evaluated, and 844 of these patients (8.2%) did not receive the treatment. The reasons for admission / treatment of the patients were 35.3% (3647) low back and hip pain, 33.9% (3503) osteoarthritis of the knee, 13.3% (1369) neck pain. The number of sessions was 3.90±2.0 for completed treatments. Treatment results of the patients showed a significant difference according to gender ($p<0.001$). There was a statistically significant difference between the mean number of sessions according to the gender of the patients ($p<0.001$). There was a significant relationship between the age of the patients and the treatment results according to the results of the one-way analysis of variance (Anova) ($p<0.001$). There is a significant difference between the mean of sessions according to the diagnosis distribution of patients ($p<0.001$).
Conclusions: Better results can be obtained with the right patient selection and informing the patient correctly. Epidemiological studies are of great importance to learn these.
Keywords: Prolotherapy, Musculoskeletal Disorders, Pain, Epidemiology

INTRODUCTION

Prolotherapy is a regenerative injection-based treatment that is commonly used for damaged or degenerated connective tissue healing of musculoskeletal disorders [1–3]. The word "prolotherapy" was used first by Dr. George Hackett in 1950 [1]. Chronic musculoskeletal pain occurs due to inadequate repair of connective tissue. Prolotherapy is used to improve this inadequate healing process for eliminating pain [1,4]. This is based on the idea of relieving pain by enhancing the ligaments with injections of irritating, cell proliferation-stimulating solutions. Prolotherapy injections are typically administered in or near the area with connective tissue dysfunction [5–7]. It is thought that the main mechanism of action of the solutions used in prolotherapy is that they increase fibroblast proliferation and collagen synthesis by stimulating the wound healing mechanism after ligament injections. In this way, the strength and thickness of the tendons and ligaments increase, thus stability can be achieved in joints with laxity [4,6,8,9].

The natural wound healing process underlies the mechanism of action of prolotherapy. In prolotherapy injections, local inflammation occurs in the area where the proliferate solution is applied, which triggers the release of growth factors and collagen deposition. Growth factors play a major role in tissue repair and cell proliferation in wound healing; angiogenesis, cell proliferation, extracellular matrix formation, cell differentiation. Proliferation occurs in human cartilage cells

exposed to a mixture of transforming growth factor (TGF), insulin-like growth factor-1 (IGF-1), basic fibroblast growth factor (bFGF). Human cartilage cells have the potential to form many growth factors. In addition, since the cells in the region secrete growth factors during the repair process after tendon and ligament injury, if the secretion of these factors is stimulated, a similar healing process will be initiated [4,10]. This is the basic logic in the mechanism of action of prolotherapy injections. Following prolotherapy, the healing process begins as a result of triggering inflammation or directly secreted growth factors and stimulated cytokines. By providing proliferation and strengthening of newly formed connective tissue, it also stabilizes the joint and causes pain and disability to decrease [4,8,11].

Irritant solutions are used for injections and performed into tender ligamentous and tendinous attachments [1213]. The most commonly used injectant solution in prolotherapy is hypertonic dextrose [3,5,14–16] Dextrose is an ideal proliferative solution for prolotherapy injections. It is a very safe substance because it is soluble in water and is included in the normal content of blood biochemistry. Being easy to obtain and being economical has been effective in its spread. Dextrose prolotherapy affects many mechanisms such as direct effect, osmotic effect, and inflammatory growth effect [4,8,15].

Our Traditional and Complementary Medicine Center of our hospital was opened on 1 January 2017 and were started to perform prolotherapy. Our standard procedure at the first examination of the patients, following the routine physical examination, complete blood, liver and bleeding serum biomarkers and direct radiographs are requested. Patients whose complaints continue despite conservative treatment were accepted for treatment. Patients with unstable hypertension/diabetes and treat with antithrombotic medicine cannot be discontinued through a cardiology consultation were not included in the treatment. All patients were reminded at each contact to avoid NSAIDs and to limit the overuse of the relevant area. Standard home exercise programs were prescribed for all areas. The range of motion and stretching exercises of the relevant area were started. After 2 weeks, strengthening exercises were added. The stretching and isotonic strengthening exercises were prescribed and patients have continued this program until the next control. Activities above the daily level might cause pain, so patients were restricted from activities in the first three days after the injection.

The epidemiological studies about traditional and complementary medicine are president in the literature, although, there is no epidemiologic prolotherapy study founded. This study aimed to classify age, gender, pain areas, diagnosis, number of sessions in patients with musculoskeletal disorders who applied to our center for prolotherapy.

MATERIALS AND METHODS

This was a retrospective epidemiologic study. Ten thousand three hundred nineteen patients who were applied to our outpatient clinic between January 1, 2017 and 2021 were included in the study. A local Ethics Committee approved the study protocols. (Study number: 2021/47, date:23.07.2021)

Forty one thousand nine hundred fifty six patients' registrations were done between 1 January 2017 and 2021. The patient is examined at the first application. If the treatment is not suitable for the patients (uncontrolled diabetes mellitus/ hypertension, antithrombotic medicine usage etc), their examinations and consultations are requested. At the next visit, it is decided whether it is suitable for treatment with these results or further examination is requested. As a result, the patient were classified as not received/ continue to the treatment, waiting for the treatment, the patient stopped treatment, the patient's treatment was terminated, and completed the treatment.

Not received: Immunodeficiency; cancer; active inflammatory or connective tissue disease; unstable hypertension; active endocrine disorder; and active neurological disorder; and usage of anticoagulants were the exclusion criteria's of the prolotherapy treatment. These patients are not appropriate for the treatment.

Continue: It refers to the patients whose treatment has not yet been completed as of January 1, 2021, and who are continuing the treatment.

Waiting for the treatment: The patient is appropriate for the treatment. The treatment is explained. If the patient does not take any conservative treatment, first of all, received associate policlinics. If conservative treatments used and did not sufficient, the exercises are described and the patient waits for his/her turn.

The patient stopped treatment: The prolotherapy treatment is a difficult application for the patient. Sometimes patients cannot tolerate the injections and give up the treatment.

The patient's treatment was terminated: Sometimes the patient does not do what is called and does not

Volume: 3 **Issue:** 2
Year: 2022
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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

follow their follow-up so physicians terminate the treatment.

Completed the treatment: When the patient recovered, three follow-ups were done two months apart and was removed from follow-ups.

The recurrent records of the same patients with the same reason and records for acupuncture were excluded. Also, the records for the diagnosis and treatments of trigeminal neuralgia that requiring long treatment sessions were excluded in order not to affect the number of sessions.

Statistical analyses

Statistical Package for Social Sciences software (IBM 25.0) was used for the statistical analyses. The nominal variables were presented as number, percent and frequency, and continuous variables were presented as mean ± SD. The normality tests were performed first. The t-test (Independent Samples t Test), Anova (One-Way Variance Analysis) and Pearson Correlation test analysis were performed to evaluate the significance of the means' difference between two parametric independent groups as a result of the normal distribution of the data. The Post-Hoc Tukey test was conducted for the difference between the groups with significant differences. Chi-square analysis was used to compare categorical data. p significance value was accepted as 0.05 and 0.01.

RESULTS

The number of patients' injured area was 10319 with the age range of 2-103 (mean 54.2±13.8). Frequency of age is shown in Figure 1. 2886 male (28.0%) and 7433 females (72.0%) were evaluated, and 844 of these patients (8.2%) did not receive the treatment. 2094 patients' treatment (20.3%) were continuing, 715 were waiting for the treatment (6.9%), 642 patients (6.2%) stopped the treatment, 176 patients' treatment (1.7%) was terminated, and 5848 patients (5.7%) completed the treatment. The reasons for admission / treatment of the patients were 35.3% (3647) low back and hip pain, 33.9% (3503) osteoarthritis of the knee, 13.3% (1369) neck pain and 3.7% (384) back pain, 1.0% (106) synovitis-tenosynovitis, 2.0% (209) sprain, 0.6% (65) lateral epicondylitis, 0.4% (37) calcaneal spur, 0.03% (4) avascular necrosis, 0.5% (52) headache, 0.3% (33) fibromyalgia, 0.1% (10) trigger finger, 1.3% (138) other knee disorders, 2.1% (218) shoulder disorders, and 5.3% (544) other joints disorders. The number of sessions was 3,90±2.0 for completed treatments.

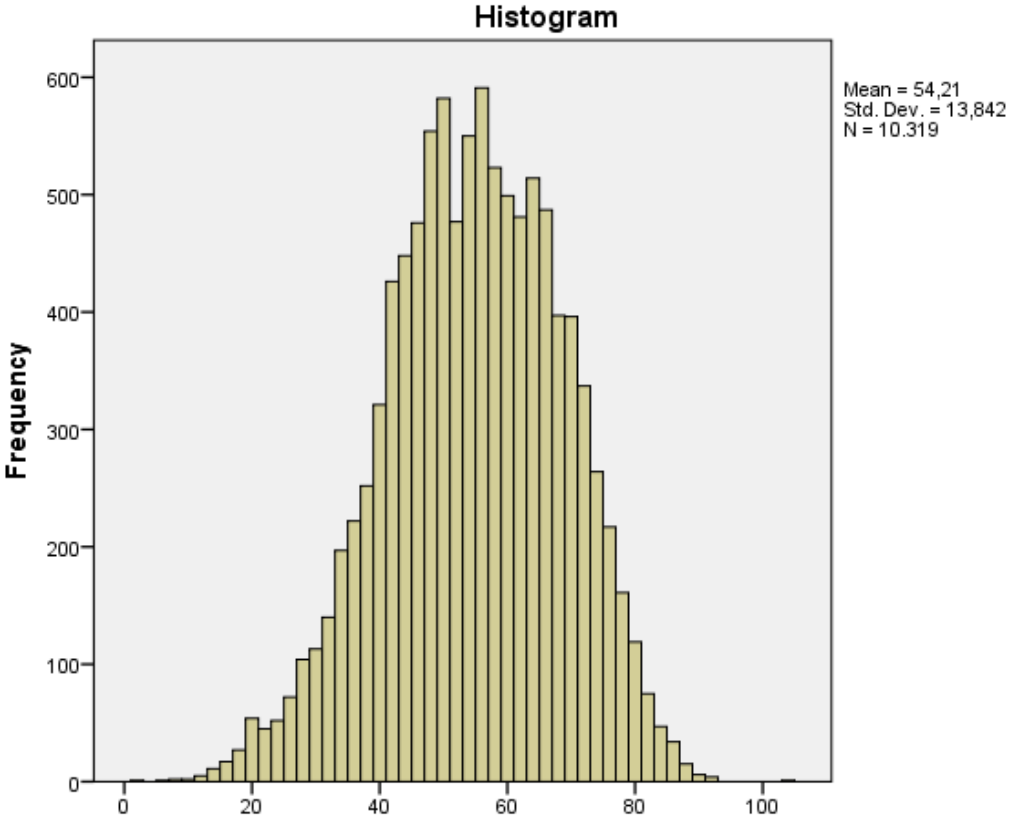

Figure 1. Frequency of Age

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Treatment results of the patients showed a significant difference according to gender (p<0.001) (Table 1). There was a statistically significant difference between the mean number of sessions according to the gender of the patients (p<0.001) (Table 2). There was a significant relationship between the age of the patients and the treatment results according to the results of the one-way analysis of variance (Anova) (p<0.001) (Table 3).

Table 1. Comparison of Treatment Results by Gender

Treatment Results	n / %	Gender		Total
		Male	Female	
Not received	n	304	540	844
	%	36.0	64.0	100.0
Continue	n	631	1463	2094
	%	30.1	69.9	100.0
Waiting for the treatment	n	221	494	715
	%	30.9	69.1	100.0
The patient stopped treatment	n	185	457	642
	%	28.8	71.2	100.0
The patient's treatment was terminated	n	42	134	176
	%	23.9	76.1	100.0
Completed the treatment	n	1503	4345	5848
	%	25.7	74.3	100.0
Total	n	2886	7433	10319
	%	28.0	72.0	100.0
Chi-Square: 51.719		p- value: <0.001		

n: Number

Table 2. Comparison of the mean number of sessions according to the gender

	Gender	n	Mean	SD	t	p
The number of sessions for overall treatments	Male	2886	2.77	2.279	-6.319	<0.001
	Female	7433	3.09	2.295		
The number of sessions for completed treatments	Male	1506	3.77	2.086	-2.848	0.004
	Female	4342	3.95	2.086		

n: Number; SD: Standard deviation

Table 3. Correlation of Patient Results with Age

	n	Mean	SD	F	p
Not received	844	50.73	17.1	45.264	<0.001
Continue	2094	52.60	12.9		
Waiting for the treatment	715	50.58	14.3		
The patient stopped treatment	642	54.70	13.5		
The patient's treatment was terminated	176	60.93	13.1		
Completed the treatment	5848	55.47	13.3		

n: Number; SD: Standard deviation

There is a significant difference between the mean of sessions according to the diagnosis distribution of patients (p<0.001) (Table 4).

Table 4. Comparison of the mean of sessions according to the diagnosis distribution of patients.

	Overall patients					Completed patients		
	n	Mean	SD	F	p	n	Mean	SD
Low back and hip pain	3647	3.17	2.4			1572	4.74	1.9
Osteoarthritis of the knee	3502	2.94	2.1			2620	3.35	2.0
Neck pain	1369	3.31	2.3			741	4.58	1.8
Synovitis-tenosynovitis	106	2.10	1.7			66	2.8	1.6
Back pain	384	2.48	1.8			118	3.4	1.7
Sprain	209	2.66	2.2			104	3.8	2.0
Other joints disorders	544	2.81	2.1			336	3.6	1.9
Headache	52	1.21	1.8	13.456	<0.001	5	3.5	1.7
Other knee disorders	138	1.96	1.7			80	2.6	1.6
Fibromyalgia	33	.79	1.4			6	2.3	1.0
Shoulder disorders	218	2.89	2.0			125	3.5	1.9
Lateral epicondylitis	65	2.65	1.9			38	3.6	1.7
Calcaneal spur	37	3.00	1.7			28	3.3	1.6
Avascular necrosis	4	2.25	1.5			3	3.0	0.0
Trigger finger	11	3.09	2.0			6	4.0	2.2

n: Number; SD: Standard deviation

DISCUSSION

This study tried to eliminate the lack of prolotherapy epidemiological studies that we could not find in the literature. Our center is in high demand in terms of prolotherapy. We did not find any other prolotherapy study with this amount of patient data in the literature. Ten thousand three hundred nineteen injured areas were evaluated in 3 years and 5848 were completed the prolotherapy treatment in our center. Although women prefer prolotherapy treatment 2.5 times more than men, the number of sessions required in the treatment of men was found to be less than women. The most common reasons to prefer the prolotherapy treatments were low back and hip pain and osteoarthritis of the knee nearly with the same ratio. Almost one out of three patients were preferred the treatment because of low back and hip pain, one for osteoarthritis of the knee, and one for remaining reasons. The most common remaining reason was neck pain. The area that needed the most sessions in the treatment was the neck.

The literature showed that the complementary and alternative medicine treatment users were mostly women (78.6%)[17]. Similarly in our study, 72% of the prolotherapy users were women. The patient's age range was wide, 2-103 years old (A two years old child was brought by his family due to his unresolved restlessness). The physicians did all patients' physical examinations, but injection applications were not preferred under fifteen years-old.

The most common pain along the spine belongs to the lumbar region. Chronic low back pain is one of the most common diseases and is one of the leading causes of labor loss in public[18]. It causes temporary or permanent disability[18,19]. Chronic low back pain is one of the most common indications for prolotherapy based on the repair and strengthening of the spinal ligaments. There is a debate in the literature about injection and exercise protocols for chronic low back pain, and studies have conflicting results[20]. Intra-articular prolotherapy injection is significantly superior to corticosteroid injection in sacroiliac joint pain. Although there was no significant difference in pain compared to intra-articular steroid injection, it was reported that long-term pain did not recur in the prolotherapy group[21]. In a randomized controlled study on sclerosing injections, it was reported that prolotherapy had similar results with lignocaine administered in combination with saline in chronic low back pain[22]. Injections were given once a week for 3 weeks, unlike normal administration. Another randomized controlled trial with 2x2 factorial for nonspecific chronic low back pain compared prolotherapy with saline injection and flexion exercise with no exercise therapy. All ligament injections caused significant decreases in pain and disability scores during follow-up. The results were found to be similar for prolotherapy and saline or for flexion exercises and daily life[20]. When integrated with spinal manipulation, exercise, and other interventions, prolotherapy may have a better effect on chronic low back pain and disability, but prolotherapy alone is not seen as an effective treatment for chronic low back pain[19]. Solmaz et al. used prolotherapy and exercise therapy together in failed back surgery syndrome and achieved success[8]. Another study of Solmaz et al. reported that 654 patients with low back pain or lumbar disc herniation were treated with prolotherapy and the Visual Analogue Scale (VAS) scores decreased from 7.2±1.1 before the treatment to 0.9±0.9 after 1 year of the treatment and only 34 patients had poor clinical results. A home exercise program was given with to the patients with the prolotherapy treatment in this study[23]. We are routinely used prolotherapy and exercise together and get good results.

A review of spinal pain mentions 26 observational cohorts and 5 randomized controlled 31 clinical prolotherapy trials conducted up to 2005. Indications in these studies were low back pain (22), neck pain (3), cervical headache (3), and back or chest pain (3). A total of 20 sclerosing solutions were used in these studies. The most commonly used sclerosing solution is a mixture of 12.5% dextrose, 12.5% glycerin, 1.25% phenol, and 0.25% lidocaine. It has been stated that there are wide differences in treatment protocols such as dose, number of treatments, and use of adjunct therapies. Most cohort studies were of only moderate quality, and they were found to differ greatly in terms of injectables and co-interventions[24]. The limitations in the methodologies of studies on prolotherapy treatment in mechanical low back pain and the heterogeneity of clinical protocols make it difficult to evaluate these studies collectively[19,25]. In most clinical studies, it has been demonstrated that although the differences between treatment and control groups are not always statistically significant, they report positive results such as reduced pain or disability[24]. In addition, Miller et al. the response to leg pain secondary to moderate to severe lumbar degenerate disc disease appears

promising in a case series[26]. We are using dextrose as prolotherapy solution in our center. Treatment is not completed when there is at least 50% improvement from baseline. When we complete the treatment, 3 control examinations are performed at 2-month intervals, pain complaints and physical examination and palpation are checked for pain, and when the improvement is confirmed, the treatment is considered to be completed.

There are 1921 regions (18.6%) whose sessions have not started regardless of the diagnosis. Some of them are those who were waiting for their turn to start the session, others were those who have applied from several regions at the same time and were waiting for their turn for the region. In addition, those who did not receive the prolotherapy, or had not received any medical treatment before, or/and where the only exercise was sufficient were included in this group.

The mean of sessions was found to be approximately 3. However, the range is very wide 1-13. The enthesofascial prolotherapy is applied 6 times at the most, but the neurofascial prolotherapy can be performed up to 13 times[4]. We prefer the neurofascial prolotherapy in older patients, we already have patients up to the age of 103.

Although the number of treatments terminated or stopped by patients due to the corona pandemic increases in 2020 data, it is still low compared to the total number. This treatment application is difficult for the patients, but that means pain is more difficult for them.

CONCLUSION

There are few studies in the literature on prolotherapy treatment demanded due to chronic musculoskeletal pain. As with other complementary and alternative medicine treatments, it is more preferred by women. Better results can be obtained with the right patient selection and informing the patient correctly. Epidemiological studies are of great importance to learn these. There is still a need for epidemiological prolotherapy studies, which are lacking in the literature.

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ORIGINAL RESEARCH

The Effect of Acupressure on Menstrual Pain

Ayca Solt Kirca[1*], Gulumser Dolgun[2]

[1]Department of Midwifery, Health Science Faculty, Kırklareli University, Kırklareli, Türkiye

[2]Department of Midwifery, Health Science Faculty, Istanbul-Cerrahpaşa University, Istanbul, Türkiye

* Corresponding Author: Ayca Solt Kirca, e-mail: aycasolt@hotmail.com

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Abstract

Objective: Dysmenorrhea causes women who are working and students to lose business power, school absenteeism, and serious economic loss. This study was conducted to demonstrate the effectiveness of acupressure to reduce the pain of dysmenorrhea.

Material-Method: This study is a randomized controlled experimental trial that was conducted. The population of the study consisted of 480 female students, between November 2016- and June 2017. The sample of the study was determined as a minimum of 38 individuals for each group using power analysis. 90 female students, who met the inclusion criteria and signed informed consent forms, were included in the sample. The data were collected using Information Form, Menstrual Symptom Questionnaire, and Visual Analog Scale. Acupressure was applied to the acupuncture points of hand and foot areas in the experimental group in the company with music for 10 minutes. The control group was made to relax in the company with music for 10 minutes. Pain assessment was performed with VAS before the procedure and on the 30th, 60th, and 120th minutes after the procedure for both groups. The data were assessed using the Chi-square test, Yates chi-square Fisher exact test, numbers, and percentages.

Results: The present study had more application points (LI4 and SP6 on both arms and legs) and a shorter application time (10–12 minutes) and the experimental group's pain measurements 30th, 60th, and 120th minutes after the procedure decreased considerably.

Conclusion: Acupressure is a very effective means of decreasing dysmenorrhea. It can be assumed that applying acupressure with the same intensity for a shorter time is effective in reducing menstrual pain.

Keywords: Acupressure, Dysmenorrhea, Primary Dysmenorrhea, Pain, Midwife, Complementary and Alternative Therapy

INTRODUCTION

Primary dysmenorrhea is one of the most common gynecological problems that are mostly seen in young and nulliparous women during reproductive age and is not related to pelvic pathology[1]. Its prevalence in women of reproductive age varies between 16% and 91%[2]. One year after menarche, the primary dysmenorrhea occurring during the ovulatory period is a condition lasting mostly for 2-3 days and being accompanied by many gastrointestinal system complaints (nausea, vomiting, diarrhea, etc.) along with the pain spreading to the lower abdomen region, waist, back and legs for up to 2-3 days [1,3-5]. Women experience menses every 28–30 days on average from menarche to menopause, meaning they spend a total of about 4 years of their lives trying to cope with the resulting dysmenorrhea. This situation can negatively affect their education, work, and social life [5,6].

There are two ways to cope with primary dysmenorrhea. The first and frequently preferred are pharmacological methods. The second are non-pharmacological methods, including acupuncture, acupressure, and heat application, which many international studies have proven to reduce dysmenorrhea [3,7-8].

Acupuncture, widely used in China for more than 2000 years, is one of the oldest known medical therapies. The philosophy of this treatment is based on the self-repair of the human body [9-11]. Theoretically, acupressure opens the capillaries and regulates and increases the blood flow in the area. Accordingly, oxygen is transported more quickly and effectively to all parts of the body. It also

Volume: 3 **Issue:** 2
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supports the secretion of neurotransmitters, activates the release of chemicals in the blood such as beta-endorphin, serotonin, dopamine, and noradrenaline, and accelerates the transmission of electromagnetic signals. Thus, the immune system strengthens, the energy in the body increases, and the pain decreases. As a result, the body maintains its normal functions [5,7-8,10-12]. As such, acupressure is a method widely used in the world for reducing the complaints such as primary dysmenorrhea, pain, toothache, distress, fibromyalgia, and fatigue[10-11,13-14]. In the studies conducted on primary dysmenorrhea, dysmenorrhea and other systematic symptoms developing depending on these were determined to decrease within 2-3 hours after the acupressure application [5,7-8].

In today's society, traditional medicine is thought to be "natural" compared to modern medicine and it is thought that nature has the cure for everything. Due to the increased interest of the individuals forming the society in the non-pharmacological methods, it has become a necessity for healthcare professionals to take a part in complementary therapies. The social, economic, and psychological effects of these negativities experienced by women, who play an important role in the formation of healthy individuals and societies, throughout their lives due to the menstrual pain on the health of women cannot be ignored. Therefore, learning and performing non-invasive interventional practices for the elimination of the negativities, experienced by individuals due to dysmenorrhea, by the midwives or nurses who have the closest contact, especially with the women of the reproductive age are among their duty, authority and responsibilities. The aim of the study was to obtain data showing the efficacy of acupressure that would help midwives and nurses in controlling the pain of young girls with primary dysmenorrhea.

MATERIALS AND METHODS

Materials

Research design and participants

The study was conducted with the students studying in midwifery and nursing departments (total of 560 female student) of Kırklareli University School of Health between November 2016-June 2017. There are a total of 560 female students studying at Kırklareli University Health High School midwifery and nursing departments. The population of the study consisted of 480 female students who were voluntary to participate in the study and were at school on that day. G-Power analysis was used in the sample calculation (Version 3.1). The minimum total sample size was determined as 76 cases. With the thought that there would be lost in the cases, the sample was decided to be as 45 for each group. In addition, according to the retrospective power analysis after collecting the data, the power of the study was found as 100% for the experimental group and 99% for the control group. It was seen that the sample size in the study was sufficient.

Inclusion criteria

Can speak and understand Turkish, single and between the ages of 18 and 25, menstruates at regular intervals (21–35 days), did not take analgesics or non-steroids at least 6 hours before the procedure, did not perform any relaxing non-pharmacological practices to relieve pain at least 3 hours before the procedure, signed the informed consent form

Exclusion criteria

Uses oral contraceptives, uses an intrauterine device (IUD), diagnosed with a gynecological disease or secondary dysmenorrhea (polycystic ovarian syndrome, ovarian cysts, pelvic infection, endometriosis, adhesions in the fallopian tubes, menstrual irregularity, uterine myoma, irritable bowel infection), has a chronic disease, has a history of surgery or deterioration of tissue integrity (lower abdomen, uterus, ovaries, intestine, bladder operation), has a psychiatric disease, pregnant.

In the selection of the students meeting the inclusion criteria, the Descriptive Information Form, Menstrual Symptom Questionnaire (MSQ), and Visual Analog Scale (VAS) were used.

Data collection tools

Descriptive information form

This form was developed by the researchers in accordance with literature information. The form has a total of 29 questions defining the socio-demographic characteristics and primary dysmenorrhea.

Menstruation symptom questionnaire (MSQ)

It was developed by Chesney and Tasto in 1975. It was then re-evaluated on adolescents and updated by Negriff et al., in 2009[15]. The questionnaire is a five-point likert type scale and composed of 24 items. The MSQ score is calculated by taking the total mean score of the items on the scale. The original version of the questionnaire has three subscales. These are Negative Affect/Somatic Complaints', 'Menstrual Pain' and 'Abdominal Pain'. Increased mean scores for subscales indicate that the severity of menstrual symptoms for that subscale is increasing. Its Turkish validity and

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1052531

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

sensitivity study was carried out by Güvenç et al., in 2014[16].

Visual analog scale (VAS)

It was developed and used by Bond and Pilowsky in 1966 for the first time. VAS is a 0-10-cm ruler with "no pain" at one end and "worst pain" at the other end. Since the vertical VAS gives quick results and is easy to understand, it is thought to be the most appropriate scale for determining the severity of acute pain[17-18]. A separate form was used for each pain evaluation of girls who have primary dysmenorrhea in the present study. This form was adapted to Turkish by Aslan and Ontürk[19].

Ethical considerations

Written consents were obtained from the female students studying in the midwifery and nursing departments and approval was obtained from the Ethics Committee of Kırklareli University School of Health (Date:11.11.2016), Kırklareli University Institute of Health Sciences before starting the application. The researcher responded to all questions of the students in the experimental and control groups and conducted the processes. The information in the data collection forms was used only for research purposes.

Methods

Data collection procedure

The study was conducted with the students studying in the midwifery and nursing departments (a total of 560 female students) of Kırklareli University School of Health between November 2016-June 2017. There are a total of 560 female students studying at Kırklareli University School of Health midwifery and nursing departments. 480 midwifery and nursing students who agreed to participate in the study and were present in the school on that day Descriptive Information Form, MSQ, and VAS were applied. The students were divided into three groups mild, moderate and severe with the simple random draw method (using a simple table of random numbers) according to their scores from the pain scale and MSQ. Then, the students in both first and second groups were assigned to experimental and control groups homogeneously (Figure 1, Table 1). During the study, the menstruation times of the students in the experimental and control groups were recorded by the researcher by interviewing them one by one. The researcher then talked to the students on the phone every month near their menstruation times. The students who had pain after the menstruation were invited to the clinical skills laboratory located in Kırklareli University School of Health for the application. The severity of pain before the application was evaluated using VAS.

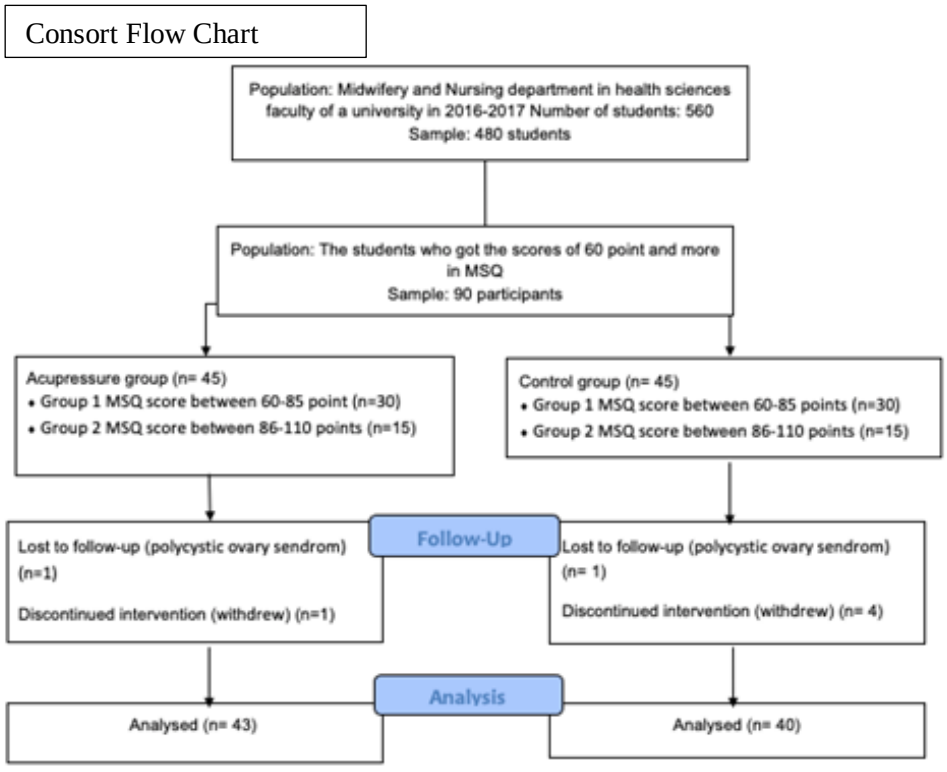

Figure 1. Diagram showing the recruitment of students and progression throughout the trial.

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1052531

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 1. MSQ score table of the experimental and control groups

Scale	Groups		Pain Scores	N	Losses	Total number of cases
MSQ	Experimental group	Group 1	60-85	30	-	43
		Group 2	86-110	15	2	
	Control group	Group 1	60-85	30	1	40
		Group 2	86-110	15	4	

Application steps of the experimental group

In a single menstruation period, each student was informed about the procedure before the application. The acupuncture points (LI4 and SP6 points) were found through a specially developed acupuncture point detector (Acumaster) (www.olusummedikal.com). The researcher used gloves during the procedure to prevent the transition of bioenergy. The application was made in a frequency that did not discomfort the individual, did not cause any pain, and had a calming effect. Prior the application, heating and preparing rubbing operation was applied for 30-45 seconds to each point. Then, a total of 10-minute application was conducted (120- second pressure and 30-second resting for each point) to the parallel points located on the lower and upper extremities.

Application steps of the control group

They were allowed to rest for ten minutes without performing any intervention in the same environment as the experimental group. VAS was administered separately to the experimental and control groups for each evaluation after the application and the results among the groups were evaluated (before the procedure=VAS 1, post-procedure 1st minute =VAS 2, post-procedure 30th minute =VAS 3, post-procedure 60th minute = VAS 4, and post-procedure 120th minute = VAS 5).

Statistical analysis

For data analysis, the SPSS 22.0 software (SPSS, Inc., Chicago, IL, USA) was used. Number, percentage, mean, and standard deviation were given in descriptive statistics, Chi-square test, independent samples t-test, and Bonferroni analysis were used. The statistical significance level was accepted as $p<.05$.

RESULTS

It was determined that there was no statistically difference between the distributions of the students' descriptive properties (such as age, BKI, use of cigarette and alchol sitatus, menarche age, menarche pain age, menstruation period) ($p>0.05$, Table 2, Table 3).

Table 2. Descriptive properties related to experimental and control group.

Properties	Experiment Group (n: 43)		Control Group (n: 40)		χ^2	p
	S	%	S	%		
Age						
18-20 ages	29	67.4	19	47.5	2.611	0.106^{Y}
21-25 ages	14	32.6	21	52.5	(sd: 1)	
BMI						
Weak	7	16.3	10	25.0	1.405	0.495
Normal	31	72.1	24	60.0	(sd: 2)	
Overweight	5	11.6	6	15.0		
Cigarette						
Smoking	8	18.6	7	17.5	0.000	1.00^{Y}
Not-smoking	35	81.4	33	82.5	(sd: 1)	
Alcohol use						
Yes	3	7.0	4	10.0		0.706^{F}
No	40	93.0	36	90.0		

Y: Since the observed number was <25, Yates corrected chi-square test was performed.
F: Since the observed number was <5, Fisher's Exact Test was conducted

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1052531

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 3. Menstruation and dysmenorrhea properties related to experimental and control group

Properties	Experiment Group (n: 43)		Control Group (n: 40)		t	P
	Min-Max	$\bar{x}$ ±SS	Min-Max	$\bar{x}$ ±SS		
First menstruation age(year)	12-17	13.65±1.17	11-17	13.28±1.26	1.408	0.163
First menstruation pain age	12-18	14.28±1.62	12-20	14.18±2.00	0.261	0.795
Severity of menstrual pain felt in the last 6 months	5-10	6.81±1.48	5-10	7.18±1.55	1.130	0.262
	S	**%**	**S**	**%**	χ^2	**P**
Menstruation period						
0-3 days	1	2.3	4	10.0	2.222	0.329
4-6 days	28	65.1	23	57.5	(sd: 2)	
7-10 days	14	32.6	13	32.5		
Menstruation cycle						
21-28 days	29	67.4	24	60.0	0.227	0.634[Y]
29-32 days	14	32.6	16	40.0	(sd: 1)	
Number of pads changed per day during menstruation						
2-3 pads	20	46.5	18	45.0	0,000	1.00 [Y]
4-20 pads	23	53.5	22	55.0	(sd: 1)	
Time to start pain before menstruation						
Before 24 hours	30	69.8	33	82.5	1.207	0.272 [Y]
Before 25-48 hours	13	30.2	7	17.5	(sd: 1)	
Dysmenorrhea resume time						
18-48 hours	31	72.1	28	70.0	0.000	1.00 [Y]
49-72 hours	12	27.9	12	30.0	(sd: 1)	
Dysmenorrhea status be in mothers/sisters						
Yes	28	65.1	19	47.5	1.950	0.105 [Y]
No	15	34.9	21	52.5	(sd: 1)	

t: Independent samples t-test, sd: 81
Y: Since the observed number was <25, Yates corrected chi-square test was performed.

The students in the study stated that they felt pain in the abdomen, inguinal, and waist region mostly before menstruation and they felt pain in abdominal and inguinal areas during menstruation. It was determined that the chilling statuses of the students before or during the menstruation increased their pain. The students in the experimental and control groups could not go to school and their social activities were prevented due to dysmenorrhea. The students used mostly hot application and analgesic drugs among non-pharmacological and pharmacological methods to relieve menstrual pain (Table 4). According to the mean scores of the students in the experimental and control groups for MSQ and its subscales, it was found that there was no statistically significant difference between the groups in terms of the students' MSQ total score and mean scores of the subscales negative affect/somatic complaints, menstrual pain symptoms, and coping methods subscale ($p>0.05$, Table 5).

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1052531

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 4. Experimental and control group areas where they feel pain, problems related to dysmenorrhea and the methods used to relieve pain

Variables	Experiment Group (n: 43)		Control Group (n: 40)	
	n	%	n	%
Region and Period*				
Before Menstruation				
Abdomen	18	41.9	17	42.5
Spoon	22	51.2	18	45.0
Waist	18	41.9	20	50.0
Others (leg, back, pelvic, head, stomach)	13	30.2	7	17.5
During Menstruation				
Abdomen	27	62.8	25	62.5
Spoon	19	44.2	23	57.5
Waist	10	23.3	14	35.0
Others(leg/back/pelvic/head/stomach)	7	16.3	5	12.5
Before menstruation or during, pain increasing status*				
Chills	38	88.4	36	90.0
Others (Standing/fatigue/stress)	4	9.3	2	5.0
No pain enhancing factor	3	7.0	4	10.0
Problems outside dysmenorrhea*				
Nausea	25	58.1	16	40.0
Weakness	15	34.9	22	55.0
Diarrhea	14	32.6	13	32.5
Vomiting	24	55.8	4	10.0
Depression	22	51.2	-	-
Others (headache/dizziness/tension/ constipation /perspiration)	6	14.0	16	40.0
Methods for pain relief*				
Hot application	34	79.1	31	77.5
Pain relievers	33	76.7	25	62.5
Herbal teas	18	41.9	19	47.5
Massage	9	20.9	17	42.5
Relaxation exercises	6	14.0	6	15.0
School absenteeism during menstruation				
Yes (1 day)	23	53.5	12	30.0
No	20	46.5	28	70.0
Prevention of social activities during dysmenorrhea				
Yes, prevention	33	76.7	26	65.0
No	10	23.3	14	35.0

* More than one zone option is marked.

The students with moderate and high MSQ score
When the dysmenorrhea mean scores of the students in the experimental and control groups were compared, it was determined that there was no significant difference between the menstruation pain mean scores of the groups before and right after the procedure (1st minute) ($p>0.05$, Table 6). Dysmenorrhea mean scores of the students in the experimental group with moderate MSQ score at the post-procedure 30th, 60th and 120th minutes were found to be very low compared to the control group ($p<0.001$, Table 6). Dysmenorrhea mean scores of the students in the experimental group with high MSQ scores at the post-procedure 30th and 60th minutes were statistically at an advanced level while their score averages at the 120th minute were found to be lower at a very advanced level compared to the control group ($p<0.001$, Table 6).

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1052531

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 5. Comparisons of mean scores of MSQ and it comparison of the averages of sub-dimensions

MSQ ve Sub-dimensions		Experiment Group (n: 43)	Control Group (n: 40)	t	P
		$\bar{x} \pm SS$	$\bar{x} \pm SS$		
MSQ Total Score		3.46±0.43	3.37±0.45	0.918	0.361
Sub-dimens	Negative effects / somatic complaints	3.30±0.55	3.21±0.59	0.745	0.458
	Menstrual pain symptoms	3.84±0.57	3.85±0.65	0.064	0.949
	Methods of coping	3.40±1.06	3.13±1.07	1.115	0.268

t: Independent samples t-test, sd: 81

As a result of the advanced analysis, the dysmenorrhea means a score of the experimental group which was the highest before the procedure started to gradually decrease after the procedure and reached the lowest level at 120th minute ($p<0.001$, Table 6). It was found that the pain means a score of the control group right after the procedure was significantly low ($p<0.05$) compared to the other measurements and there was no significant difference between the other binary measures ($p>0.05$, Table 6).

When the dysmenorrhea levels of groups with high MSQ scores by the time were evaluated with Bonferroni advanced analysis, it was found that there was no significant difference between the pain mean scores of the experimental group only at the 30th and 60th minutes ($p>0.05$); whereas, there was a significant difference between the pain mean scores in the other binary measurements ($p<0.05$) and the pain scores gradually decreased. It was determined that the pain mean scores of the control group right after the procedure was significantly lower than the values obtained at the post-procedure 30th, 60th, and 120th minutes ($p<0.05$, Table 6), and there was no significant difference between the other binary time periods ($p>0.05$, Table 6).

Table 6. Comparisons of mean scores of dysmenorrhea according to time and MSQ level of the experimental and control group

MSQ Score	Time period	Experiment Group (n:43)	Control Group (n:40)	Test	p
		$\bar{x} \pm SS$	$\bar{x} \pm SS$		
2.51-3.75 score (Middle)	Before the transaction [1]	6.50±1.04	6.24±0.99	t: 0.978	0.332
	Immediately after the transaction (1st minute)[2]	5.03±1.73	5.69±1.28	t: 0.1649	0.105
	30th minute[3]	3.90±1.71	6.21±1.15	t: 6.069	**0.000**
	60th minute[4]	2.80±2.01	6.48±1.12	t: 8.737	**0.000**
	120th minute[5]	1.13±1.33	6.55±1.27	t: 15.980	**0.000**
	Test	*F: 81.124*	*F: 3.770*		
	p	***0.000***	***0.016***		
	Difference	*1>2>3>4>5*	*2<4,5*		
3.76-5.0 score (High)	Before the transaction [1]	6.92±1.26	6.45±0.69	U: 54.0	0.290
	Immediately after the transaction (1st minute) [2]	5.08±2.36	5.45±1.37	U: 64.0	0.658
	30th second[3]	3.46±2.47	6.55±1.13	U: 22.0	**0.004**
	60th second[4]	3.00±2.35	6.45±1.29	U: 16.0	**0.001**
	120th second[5]	1.62±1.56	7.00±1.26	U: 0.0	**0.000**
	Test	*χ^2: 46.393*	*χ^2: 17.443*		
	p	***0.000***	***0.002***		
	Difference	*1>2>3,4>5*	*2<1,3,4,5*		

F: Analysis of variance in repeated measures, sd: 4 (advanced analysis: Bonferroni test $\chi 2$: Friedman test, sd: 4 (advanced analysis: Bonferroni corrected Wilcoxon test t: Independent samples t-test, sd: 57 U: Mann Whitney U test

Volume: 3 **Issue:** 2
Year: 2022
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Publisher
Duzce University

DISCUSSION

Primary dysmenorrhea is a common gynecological problem seen in women of reproductive age. Drug use is one of the most commonly used methods by individuals to reduce dysmenorrhea and enhance the quality of life. These drugs can cause many side effects (abdominal pain, nausea, etc) in women with dysmenorrhea. Acupressure, one of these methods, strengthens the immune system by activating the release of many chemicals into the blood. Thus, it increases the energy in the body and decreases the pain[5,10,20].

This study's results showed that the majority (57.8%) of the participating students were aged 18–20 years old, had a normal BMI, and did not smoke or drink alcohol, which is similar to results from national and international studies [4,5,21-25]. The reported menarche age, menarche pain age, and dysmenorrhea according to the students' VAS scores were also similar to extant studies [21-23,25-29], as were the students' menstruation period, menstrual cycles, and their pain before menstrual bleeding [20,25,29-30]. The majority of students with primary dysmenorrhea in the study reported that they felt pain mostly in the abdominal, inguinal, and waist regions before and during menstruation, chilling increased the pain more, and they had complaints such as nausea, fatigue, vomiting, and depression along with the pain. The menstrual symptoms in the study are similar to the national and international literature [20,27,30-32].

When the literature is examined, risk factors for dysmenorrhea include dysmenorrhea in family history[3]. In the study, the students with primary dysmenorrhea were found to have menstruation pain complaints in their mother/sister. The results are compatible with the study results[31,33-35].

Women prefer pharmacological and non-pharmacological treatment methods such as analgesics, hot application, acupressure, herbal teas, and massage while coping with primary dysmenorrhea[3]. When the results of the literature and the present study are examined, it is remarkable that especially the use of analgesics is common[32,35-37]. Considering the fact that the young girls of reproductive age and their families do not have adequate information about the non-pharmacological agents, their side effects, and the toxic effects that may occur later, it is important that midwives provide training to the young girls with primary dysmenorrhea and their families about non-pharmacological methods especially by using social media and press, organizing seminars in schools and public education centers.

In the literature, it is known that people with dysmenorrhea history have school absences and interrupted social activities during their menstrual period [3,5-6,8]. It was determined in this study that the students could not go to school during their menstrual period and their social activities were interrupted during dysmenorrhea. Similar results were found in the studies[14,27,30,38].

In the study, the effect of acupressure application on primary dysmenorrhea was evaluated five times using VAS. When the menstrual pain mean scores of the groups with moderate and high Menstruation Symptom Questionnaire scores were evaluated separately according to time of each measurement, no significant difference was found between the pain mean scores of the groups from VAS 1 and VAS 2. It was an expected result that there was no difference between the groups in the first pain evaluation conducted in both groups before the application (VAS 1). Right after the application (VAS 2), the result was not significant although there was a decrease in dysmenorrhea in both groups. The reason behind why there was no significant difference in pain reduction was that the students in the control group were only resting with music and the effect of acupressure did not start immediately in the experimental group. In the acupressure group, the regulation of blood flow, the activation of the release of chemicals in the blood, the acceleration of the transmission of electromagnetic signals, and thus energy increase in the body take time [5,7,8,10,11,12]. If the effect happened immediately, it might have been thought that this was not caused by the effect of acupressure but by the effect of resting with music and being touched and cared for during the application and thus the pain decreased psychologically. In similar studies, it has been determined that there is no statistically significant difference in the pain levels of the experimental and control groups in the evaluations made with VAS before and right after the application.

In the study, when the menstrual pain mean scores of the groups with moderate and high Menstruation Symptom Questionnaire scores were evaluated in terms of each measurement time, it was determined that the menstrual pain mean score of the experimental group in VAS 3, VAS 4 and VAS 5 after the acupressure applied at the LI4 and SP6 acupuncture points was significantly lower at very advanced level compared to the control group. In

similar studies, while acupressure was applied only to SP6 points for 20 minutes, acupressure was applied to other acupuncture points along with the LIV4 point for 20 minutes in some studies, and dysmenorrhea was determined to decrease [5,14,20,39-41]. Although the application points were a lot (LI4 and SP6) and the application time was less (pressure was applied to four points for a totally of 10-12 minutes) in the study, VAS scores were obtained at the post-procedure 30th, 60th, and 120th minutes are in parallel with the study results. It can be thought in the study that applying pressure with the same intensity manually in a short time is effective in the reduction of pain.

Limitations

Limitations of the study are that it took a long time to establish a trusting environment due to the beliefs and attitudes of the students towards the non-pharmacological processes, some students wanted to withdraw from the application during the study and there was a loss of cases in the study because some students were referred to the doctor because of their very severe pain and they were diagnosed with polycystic ovarian as a result of the examination accompanied by ultrasound.

CONCLUSION

Although the results of the present study are similar to the other study examples, the interviews made with the students after the study also showed that acupressure application decreased the pain, medication needs, and school absences of the students with primary dysmenorrhea during the menstrual period. Besides, it can be asserted that acupressure is an effective, easy, and inexpensive method to cope with menstrual pain.

Although there are studies in the literature indicating that acupressure is frequently used in reducing birth pain, it is particularly remarkable that the studies stating that acupressure reduces primary dysmenorrhea have not been conducted in Turkey. It is important that midwives follow non-pharmacological treatment methods for the promotion and maintenance of women's health which are among their duties, powers, and responsibilities, receive training about them, apply to the individuals who apply with the complaint of primary dysmenorrhea, and teach these applications to the people when necessary. We believe that the results of this study are important in terms of being guiding in closing the current gap.

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ORIGINAL RESEARCH

The Effect of Training Provided to Mothers on Their Non-Functional Practices and Maternal Self-Efficacy in Preventing Early Childhood Diarrhea

Pinar Bekar[1*], Duygu Arikan[2]

[1]Department of Child Development, Bucak School of Health, Burdur Mehmet Akif Ersoy University, Bucak/Burdur, Türkiye

[2]Department of Child Health and Diseases Nursing, Faculty of Nursing, Atatürk University, Erzurum, Türkiye

* Corresponding Author: Pınar Bekar, e-mail: pinar_24xx@hotmail.com

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Abstract

Objective: This study was carried out to examine the effects of education on "Non-Functional Practices and Prevention of Early Childhood Diarrhea" on non-functional practices of mothers for child care and maternal self-efficacy in preventing early childhood diarrhea.

Materials-Methods: The research was carried out as a pretest-posttest quasi-experimental model with a control group. The sample of the study consisted of mothers who met the research criteria and had at least one child between the ages of 0-5 who applied to 5 Family Health Centers in the city center of Erzincan in Turkey between the dates of the research. The study was completed with a total of 128 mothers (64 in the control group, 64 in the experimental group).

Results: It was found that mothers' mean scores from the maternal self-efficacy scale for preventing early childhood diarrhea after training were higher than before training. After the training given, it was determined that there was a general decrease in the non-functional practices of mothers for child care.

Conclusions: It was concluded that the education given reduced the non-functional practices for child care and increased maternal self-efficacy for prevent early childhood diarrhea.

Keywords: Childhood, Diarrhea, Nursing, Self-Efficacy

INTRODUCTION

Diarrhea is one of the most prominent causes of mortality and morbidity in infants and children in developing countries[1-3]. According to the World Health Organization (WHO) diarrhea is the second most common cause of mortality among children under the age of five and it is responsible for the deaths of approximately 525,000 children every year[4]. According to the 2019 data from the Turkish Statistical Institute, diarrhea was found in 28.7% of children in the 0-6 age group[5].

The most important reason that diarrhea is fatal is having a lack of the knowledge about how to protect against it, and the wrong information or a lack of knowledge about how to treat it[6]. The incidence of diarrhea, which is a fundamental cause of infant mortality in Turkey, might be decreased through health education and teaching about protective measures[1]. Nurses play an important role in advising families how to prevent diarrhea (for example, through child nutrition, fluid intake, hygiene, vaccinations) and giving training on how to protect children[1,7]. Studies have shown that mothers' knowledge about diarrhea increased after they had been educated[8-11]. Self-confidence or Self-efficacy has a positive effect on an individual's knowledge[12].

Training is required in order to increase individuals' self-efficacy, and training programs should include the basic elements necessary to increase' self-efficacy[13]. A study reported that positive changes occurred in the beliefs and practices of expectant mothers at the end of the training, which included transferring information supporting correct practices regarding pregnancy, birth, puerperium and infant care[11]. Non-functional beliefs and practices involve unchanging and permanent forms of behavior, which emerge during childhood and are repeated throughout life[14, 15].

Volume: 3 **Issue:** 2
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Publisher
Duzce University

A baby may find itself in a non-functional environment from the moment it is born[14]. Some studies reported that waiting for three azans (the call to prayer in Islam) before breastfeeding the newborn, swaddling of the infant, salting of the infant's skin, and not giving colostrum to the baby are unhealthy practices[16-24]. These postnatal traditions are harmful to both mothers and babies, prolong the healing process for both of them, and may even cause their death[21]. Some studies determined that educating mothers about non-functional practices increased their levels of knowledge about this topic[11, 25, 26]. Nurses should be aware of the traditional practices in the society and play an active role in eliminating the harmful ones of traditional practices[21].

We found that studies on the effect of education on maternal self-Efficacy for prevent early childhood diarrhea are limited. It is expected that the results of this study may contribute to the helping to prevent non-functional practices, and increase maternal self-efficacy in preventing early childhood diarrhea.

MATERIALS AND METHODS

Research type

This study was performed to examine the effects of education on "Non-Functional Practices and Prevention of Early Childhood Diarrhea" on non-functional practices of mothers for child care and maternal self-efficacy in preventing early childhood diarrhea. The study was a quasi-experimental pretest-posttest design.

The research hypotheses were as follows;

H1: Training given to mothers about "Non-Functional Practices and Prevention of Early Childhood Diarrhea" increases maternal self-efficacy in preventing early childhood diarrhea.

H2: Training given to mothers about "Non-Functional Practices and Prevention of Early Childhood Diarrhea" reduces their non-functional child care practices.

Research population and sample selection

The population of the study consisted of mothers who had at least one child between the ages of 0-5 who applied to any of the five Family Health Centers (FHCs) included in the study between March 01, 2017 and June 30, 2017. The sample of the study consisted of 140 mothers (70 in the experimental group and 70 in the control group) who were selected using a random sampling method, met the inclusion criteria and agreed to participate in the research. Because 6 mothers wanted to withdraw from the study and 6 mothers declared that they would not participate in the next interviews, the study was completed with 64 experimental and 64 control groups. By conducting this research with 128 total participants (64 in each group), it was determined that 80% power would be reached at a 0.05 significance level with a 95 % confidence interval.

In order for the mothers included in the control and experimental groups not to affect each other in the training to be given, first the mothers in the control group and then the mothers in the experimental group were included in the study. Following the collection of the study data, the control group was given a training booklet.

The criteria for the mothers participating in the research were as follows:

- Having at least one child aged between 0 and 5.
- Not having a mental health problem or any other problem that might prevent her from understanding the scale.
- Willing to communicate and agreeing to participate in the research.
- Being older than 18.

Data collection tools

Question form

This form was created with reference to the relevant literature[6, 7, 21]. This form consists of 17 questions about the characteristics of participants, questions related to diarrhea, and their domestic hygiene conditions.

The maternal self-efficacy scale for preventing early childhood diarrhea

This scale was developed by Joventino et al. (2013) in order to prevent early childhood diarrhea[27]. It was adapted into Turkish by Bekar and Arikan[28, 29]. In the Turkish version, the 12th and 14th items of the original scale were excluded because their item-total score correlation was low. The scale used in this research consists of 22 items and a three-factor structure.

In the scale, each item scores between 1 and 5 points depending on the answers given. The total score obtainable from the scale thus ranges from 22 to 110. Total scores which are less than or equal to 96 (< 25th percentile) show low self-efficacy, total scores between 97 and 101 (25th percentile– 50th percentile) demonstrate medium self-efficacy, and total scores higher than or equal to 102 (> 50th percentile) show high self-efficacy. The three factors of the scale are as follows:

1st Factor: this factor consists of nine items in total (items 4, 5, 6, 9, 13, 15, 17, and 21) and is named "Personal Hygiene".

2nd Factor: this factor consists of nine items in total (items 1, 2, 3, 7, 8, 10, 11, 12, and 22) and is named "Child-Oriented Hygienic Behaviours".
3rd Factor: this factor consists of five items in total (items 14, 16, 18, 19, and 20) is named "General Hygienic Behaviours"[28, 29].
In this study, the Cronbach's α coefficient of the scale was determined to be 0.74.

Survey of non-functional child care practices

This survey was prepared in accordance with the literature and consists of 13 questions to determine non-functional practices related to child care [14, 16, 30-32]. The measurability and intelligibility of the survey were evaluated by three experts. The questions are answered with either "yes" or "no". "Yes" and "no" answers from the mothers indicate their non-functional practices or positive functional practices, respectively.

Training tools

Training booklet

The training booklet was prepared in accordance with the literature[7, 16-18, 20, 21]. The information contained in the booklet is as follows; what diarrhea is, what can be done at home to treat diarrhea, oral fluid treatment (ORS), the situations that require the child to be taken to the hospital, what to do to protect the child from diarrhea, clean drinking water and other water sources, nutritional recommendations for infants, nutritional recommendations for preschool children, factors that lead to food contamination and impair food safety, ways to ensure food safety, personal hygiene, food hygiene, and the effects of vinegar and traditional practices.

Data collection

The FHCs were visited on five days during the week, and the mothers who met the research criteria and consented to participate in the research were included in the study. The study was first conducted with the control group and then subsequently with the experimental group. In the first interview, information about the study was given to the mothers and the pretest data were collected. Immediately afterwards, only the mothers in the experimental group were given training on "Non-Functional Practices and Prevention of Early Childhood Diarrhea".
The purpose of education is to prevent children from having diarrhea, to apply the right practices when they have diarrhea, to strengthen the self-efficacy of mothers on these issues, and to be aware of and prevent non-functional beliefs and practices of mothers. The trainings were carried out individually. The training took approximately 30-45 minutes. Direct instruction, question-answer and discussion training methods were used. The education given to the mothers was explained by showing them from the training booklet. Training was provided in line with the content of the training booklet.
In the second interview, 2 weeks after the first interview with the mothers in the experimental group; questions were asked about non-functional practices and diarrhea, feedback was received, missing information was reinforced, questions asked by mothers were answered, and a training booklet was given.
One week after the second interview, the posttest were collected in the third interview. Pretest and Posttest data were collected by using "the Question Form", "the Survey of Non-functional Child Care Practices", and "the Maternal Self-Efficacy Scale for Preventing Early Childhood Diarrhea" for mothers in the experimental and control groups.
During the study, a total of 3 interviews were conducted with the mothers in the experimental group, one in the FHC and 2 in a home visit, and 1 time training was given and general reminders were made by asking questions about education once. A total of 2 interviews were conducted with the mothers in the control group, one in the FHC and the other in a home visit. No intervention was performed on the mothers in the control group. After the collection of the study data was completed, the training booklet was distributed to the mothers in the control group.

Statistical analysis

SPSS for Windows 22.00 software programs were used to analyse the data. The Shapiro–Wilk test, the descriptive statistics, the McNemar test, the Chi-square test, and the Wilcoxon test were used. $p < 0.05$ was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the University (Number: 2016/06/5, date: 17.06.2016) and official permission was obtained from the relevant institution. Parents of the children who met the inclusion criteria were informed of the aim of the study and then their questions were answered and their verbal and written consent was obtained.

RESULTS

When we examined the socio-demographic findings of the children and their family in the experimental group, 67.1% of the mothers were 31 years and older and 65.5% of the fathers were in the 31-40 age

Volume: 3 **Issue:** 2
Year: 2022
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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

group. 50% of children are girls and 48.4% of families have two children. 78.1% of mothers are housewives and 42.2% of fathers are civil servants. 34.4% of the mothers had high school education, and 46.8% of the fathers had a university education or higher. While 78.1% of the mothers are not working, all of the fathers are working. The income of 59.4% of the families is equal to their expenses.

When we examined the socio-demographic findings of the children and their family in the control group, 56.2% of the mothers were 31 years and older, 64.1% of the fathers were in the 31-40 age group. 53.1% of children are girls and 32.8% of families have two children. It was determined that 76.6% of the mothers were housewives and 35.9% of the fathers were self-employed. 28.1% of mothers had high school education, 28.1% had university education or higher, and 39.1% of fathers had high school education. While 76.6% of the mothers are not working, all of the fathers are working. The income of 56.3% of the families is equal to their expenses.

Table 1 compares the practices and behaviors related to diarrhea and hygiene of children and their mothers in the control and experimental groups. With respect to all the variables, the control and experimental groups were found to be similar ($p > 0.05$).

Table 1. Comparison of practices and behavior of children and mothers in the control and experimental groups regarding diarrhea and hygiene.

Variables		Experimental Group		Control Group		p^a
		n	**%**	***n***	**%**	
Presence of soap at home	Yes	64	100	64	100	-
	No	-	-	-	-	
Toilet type	Flush toilet	8	12.5	7	10.9	0.164
	Squatting toilet	10	15.6	19	29.7	
	Both	46	71.9	38	59.4	
Type of drinking water given to children	Boiled and cooled	7	10.9	11	17.2	0.570
	Bottled	21	32.8	21	32.8	
	Tap water	36	56.3	32	50.0	
Does the child currently have diarrhea?	Yes	4	6.2	8	12.5	0.225
	No	60	93.8	56	87.5	
Frequency of child having diarhea	Never	4	6.3	11	17.2	0.286
	Once	5	7.8	5	7.8	
	Rarely (a maximum of twice a month)	51	79.7	44	68.8	
	Once or twice a month	4	6.2	4	6.2	
Practices when diarrhea occurs*	Consulting a doctor	31	48.4	30	46.9	0.860
	Regulating the diet	35	54.7	34	53.1	0.860
	Giving liquid/oral rehydration therapy or breastfeeding	30	46.9	28	43.8	0.723
	Practicing good hygiene	3	4.7	1	1.6	0.310
	Other practices**	4	6.3	1	1.6	0.171

* More than one answer is given. These are the people who only answered "yes".
**Other practices=Feeding children with coffee mixed with lemon juice, lemon salt, coffee mixed with yogurt, dry coffee, giving children cola
[a]= Chi-square test.

The difference between pretest and posttest scores of total scale and its subdimensions in experimental group was found to be statistically significant. The mean scores in the posttest was significant higher than the mean scores in the pretest ($p < 0.001$; Table 2).

Volume: 3 **Issue:** 2
Year: 2022
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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 2. Comparison of pretest and posttest mean scores of the mothers in the experimental group for the maternal self-efficacy scale for preventing early childhood diarrhea.

Subdimensions/Scale		*n*	Mean	SD	*p*[a]
Personal Hygiene	Pretest	64	37.80	2.85	**0.000***
	Posttest	64	39.38	1.58	
Child-Oriented Hygienic Behaviours	Pretest	64	33.98	4.17	**0.000***
	Posttest	64	39.17	3.47	
General Hygienic Behaviours	Pretest	64	23.34	1.87	**0.000***
	Posttest	64	24.53	1.13	
Total Scale	Pretest	64	95.13	7.43	**0.000***
	Posttest	64	103.08	5.31	

*$p < 0.001$
[a]= Wilcoxon test

There was no significant difference between pretest and posttest scores of total scale and its subdimensions in the control group ($p > 0.05$; Table 3).

Table 3. Comparison of pretest and posttest mean scores of the mothers in the control group for the maternal self-efficacy scale for preventing early childhood diarrhea

Subdimensions/Scale		*n*	Mean	SD	*p*[a]
Personal Hygiene	Pretest	64	38.73	2.06	0.726
	Posttest	64	38.80	2.03	
Child-Oriented Hygienic Behaviours	Pretest	64	35.78	3.44	0.908
	Posttest	64	35.97	3.85	
General Hygienic Behaviours	Pretest	64	24.30	1.52	0.549
	Posttest	64	24.25	1.61	
Total Scale	Pretest	64	98.81	5.11	0.828
	Posttest	64	99.02	5.83	

[a]= Wilcoxon test

Table 4 compares the pretest and posttest non-functional practices of the mothers in the control and experimental groups. The questions were framed in such a way that if a mother gave a "yes" answer, it means this mother follows incorrect (non-functional) practices.

There was a significant difference between the mean scores for the non-functional child care practices (except for practices related to diarrhea) of the mothers in the experimental group before and after the training ($p < 0.05$).

The difference between the mean scores for non-functional child care practices (excluding breastfeeding practices) of the mothers in the control group before and after the training was not significant ($p > 0.05$; Table 4).

When the percentages of "yes" responses given to the same statement (except for practices related to the colostrum, constipate, diarrhea, burn, and wetting of the child) in the experimental and control were compared in the posttest, the result was significantly different ($p < 0.05$). When we examine non-functional application of cold sore, no one answered "yes" in both groups for the statement regarding the non-functional application of cold sore in the posttest.

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1119862

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 4. Comparison of pretest and posttest non-functional practices of the mothers in the control and experimental groups

Items		Group				p^a
		Experimental		Control		
		n	%	*n*	%	
1. The mother's first milk (the colostrum) should not be given to the baby	Pretest	11	17.2	7	10.9	0.309
	Posttest	3	4.7	7	10.9	0.188
	p^b	**0.008**		1.00		-
2. The baby should wear yellow or should be washed the water with gold in it in order to prevent it from neonatal jaundice	Pretest	19	29.7	23	35.9	0.451
	Posttest	6	9.4	20	31.3	**0.002**
	p^b	**0.000**		0.375		-
3. It is beneficial for mothers to wait for three azans (call for prayer in Islam) before they breastfeeding their baby	Pretest	38	59.4	35	54.7	0.592
	Posttest	11	17.2	28	43.8	**0.001**
	p^b	**0.000**		**0.016**		-
4. Babies' skin should be salted in order to prevent the smell of sweat and nappy rash	Pretest	17	26.6	16	25.0	0.840
	Posttest	3	4.7	13	20.3	**0.008**
	p^b	**0.000**		0.250		-
5. Swaddling is necessary for shaping the hands and feet of babies properly and for babies to sleep comfortably	Pretest	29	45.3	32	50.0	0.595
	Posttest	11	17.2	30	46.9	**0.000**
	p^b	**0.000**		0.625		-
6. It is helpful to put wool, towel or newspaper around the back or chest of babies in order to stop them from coughing	Pretest	39	60.9	40	62.5	0.856
	Posttest	16	25.0	36	56.3	**0.000**
	p^b	**0.000**		0.219		-
7. When babies are constipated, it is necessary to put soap or olive oil in the anus and make them drink plant juice	Pretest	26	40.6	25	39.1	0.857
	Posttest	10	15.6	18	28.1	0.087
	p^b	**0.000**		**0.039**		-
8. When babies have diarrhea, they should be given soda or cola with aspirin, fed with dry coffee, and kept away from drinking water and breast milk	Pretest	6	9.4	4	6.3	0.510
	Posttest	1	1.6	4	6.3	0.365
	p^b	0.063		1.00		-
9. It is useful to hold the child upside down by its ankles, cover the child in warm soil, make the child drink boiled plant juice or scare the child when the child has wet itself	Pretest	1	1.6	6	9.4	0.115
	Posttest	0	0	4	6.3	0.119
	p^b	-		0.625		-
10. When the child's fever rises, the child's body should be massaged with a mixture of vinegar and water, and it should be wiped with cotton wetted with cologne	Pretest	32	50.0	23	35.9	0.108
	Posttest	7	10.9	21	32.8	**0.003**
	p^b	**0.000**		0.774		-
11. When the child has discomfort due to teething, a bread crust, green onion or leek should be given to the child so they can bite it	Pretest	37	57.8	32	50.0	0.375
	Posttest	10	15.6	27	42.2	**0.001**
	p^b	**0.000**		0.180		-
12. When a child has a cold sore, it is useful to apply red lipstick, or to apply a heated wooden spoon or a dirty glass cup to the cold sore	Pretest	1	1.6	1	1.6	1.000
	Posttest	-	-	-	-	-
	p^b	-		-		-
13. When a child has a burn, it is useful to put raw potatoes on the burned area, apply lavender oil, centaury oil, sesame oil, olive oil, or toothpaste	Pretest	14	21.9	10	15.6	0.365
	Posttest	3	4.7	8	12.5	0.115
	p^b	**0.001**		0.500		-

[a]= Chi-square test.
[b]= McNemar test.
Note: It was expressed over the yes answer.

DISCUSSION

After the education, the self-efficacy of mothers in preventing early childhood diarrhea increased in this study. Joventino et al. (2017) found that training given to mothers about childhood diarrhea via video increased the self-efficacy of mothers in preventing childhood diarrhea[33]. Another study found that educational interventions increased maternal self-efficacy to prevent childhood diarrhea[34]. In their studies, Öztürk and Erci found that training about newborn care and postpartum period including the topics of the mothers' self-confidence and diarrhea increased the level of the mothers' self-confidence[35]. The results of the current research are consistent with the aforementioned studies.

It was determined that the mother's non-functional child care practice information generally increased after the training, in this study. Therefore, it was concluded that non-functional child care practices generally decreased after the training. In the present study, it can be said that the mothers who received education acquired cognitive behaviors at a sufficient level. In studies consistent with our study, educating mothers about non-functional practices helped to increase their knowledge of non-functional practices[11, 25, 26].

When we examined the knowledge of mothers about the non-functional practice of diarrhea in this study, it was observed that the difference between the mean scores for all the non-functional child care practices in the experimental group before and after training was found to be significant except for "the practices regarding diarrhea". However, it was found that the percentage of the mothers in the experimental group who agreed with the statement that "When babies have diarrhea, they should be given soda or cola with aspirin, fed with dry coffee, and kept away from drinking water and breast milk" decreased after the education (1.6%) compared to the percentage before the education (9.4%). Studies in the literature have revealed that although mothers have some correct beliefs about "childhood diarrhea and its management", they also have many misconceptions, such as keeping their children away from drinking water or breast milk, feeding them with a mixture of dry coffee and yoghurt, and giving them soda or cola with aspirin[16, 22, 36]. Abdel-Aziz et al. (2016) reported that "health and diet education for diarrhea" was effective in the management of diarrhea in mothers[8]. Yalçın and Koçak (2013) found that there was an increase in the knowledge level of the mothers who were received training that includes conveying information supporting correct practices regarding pregnancy, birth, puerperium and infant care, and there was a positive change related to their non-functional practices[11]. The results of the present study are consistent with the aforementioned studies.

CONCLUSION

The results of this research have indicated that after training had been given to the mothers, an increase was found in their self-efficacy in preventing early childhood diarrhea. In addition, it was determined that the mother's non-functional child care practices generally decreased after the training. In this study, it is seen that the education is given to mothers is effective. Recommendation can be made that that practices for increasing mothers' self-efficacy and knowledge should be increased through trainings in order to help mothers to manage their child's diarrhea successfully and effectively.

The limitations of the study

The study is limited to mothers who have at least one child between the ages of 0 and 5. Another limitation is that the study was conducted in a city.

Note: This study was produced from the PhD thesis.

Author contributions: All authors contributed.

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ORIGINAL RESEARCH

Toxicological Investigation of Aqueous Extract of *Ziziphus mauritiana* Leaves on Wistar Rats

Tajudeen Owolarafe[1], Godwin Ihegboro[1], Kailani Salawu[1], Chimaobi Ononamadu[1], Mujiburrahman Fadilu[1], Bashir Musa[2]

[1]Department of Biochemistry and Forensic science, Nigeria Police Academy Wudil, Kano.
[2]Center for Dryland Agriculture, Bayero University Kano.

* Corresponding Author: Tajudeen Owolarafe, e-mail: taowolarafe@gmail.com

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Abstract

Objective: Plant parts have been useful for food and remedies to various disease conditions for man long ago, but few have been studied for their toxicological effects. The aim of this study was to evaluate the phytochemical constituents and toxicological impacts of aqueous extract (AqE) *Ziziphus mauritiana* leaves on Wistar rats.

Material-Method: The plant material was identified and authenticated at the harberium of Bayero University Kano and extraction were carried out by maceration. Phytochemical screening was carried-out using standard methods while administration of the extract was orally. Liver and kidney functional parameters were evaluated using standard kits and the histopathological evaluation were carried out according to the standard method.

Results: Qualitative phytoconstituents screening revealed the presence of all Alkaloids, Saponin. Glycosides, tannin, flavonoids and others except anthraquinones while the quantitative screen showed phenol having the highest concentration while alkaloids have the lowest concentration. Acute toxicity revealed that the extract is non-toxic with LD50 above 5000 mg/kg body weight (BW), while subchronic toxicological evaluation revealed no significant adverse effect on all haematological parameters except WBC while the liver function parameters revealed an increase in serum GGT activity at 400 mg/kg body weight and the kidney function parameters showed alteration in serum creatinine, sodium, potassium, and bicarbonate concentrations. Significant effects on liver/body weight ratio at 400 and 1000 mg/kg BW was observed. Histoarchitectural alteration was observed in liver and kidney histopathological evaluation.

Conclusion: The observation from this research indicates that prolonged administration of this extract may lead the severe adverse effects on the biological system.

Keywords: *Ziziphus* , Toxicological , Extract Phytoconstituents.

INTRODUCTION

Plant parts have been useful for food and remedies to various disease conditions for man long ago, but few have been studied for their toxicological effects [1]. These effects might be caused by secondary metabolites generated by these plants, which are usually by-products that have been reported for various bioactivities [2] such as anti-cardiovascular diseases [3]and a host of others [2]. Traditional herbal remedies have popular usage in developing countries of the world. Interestingly, the World Health Organisation in 1976 recommended its inclusion into national health care programmes with guidelines to that effect released in 1991 and 2000 [4]. Traditional medicine, according to a WHO report in 2008[5], is used for basic healthcare by over 80% of the global population [6]. *Z. mauritiana* fruits from time immemorial have been widely eaten in the northern part of Nigeria for nutrition while extracts of different parts (especially the leaves) are employed in folklore and ethno-medicine as anti-asthmatic, wound healing and aphrodisiac agents [7,8,9]. The family *Rhamnaceae* consists of about 50 - 60 genera and approximately 890 – 900 species. They are flowering plants that are generally trees, shrubs, and vines that are found all over the world, but are more frequent in subtropical and tropical climates[10]. *Ziziphus* is a genus in the *Rhamnaceae* family that contains over 40 different species

ranging from spiny shrubs to small trees [11]; It also has over 100 different tree and shrub species, both deciduous and evergreen[7]. In Nigeria, *Ziziphus species* are found in northern states such as Kano, Katsina, Bauchi, Borno and Adamawa States [12]. The species of *Ziziphus* genus that are common are *Z. mucronata* (English-Buffalo, Hausa-*Mágáryár kúúráá*), *Z. spina-christi* (English-Christs thorn, Hausa-*Kurna*), *Z. abyssinica (*English-Large Jujube, Hausa-*Samo*, *Yabo* or *Babbagi*) and *Z. mauritiana* (English-Chinese date or Indian jujube, Hausa-*Mágáryá*)[12, 13]. The specie *Z. mauritiana* has many common names such as jujube, Indian cherry, geb, ber, Chinese apple, bear tree and desert apple, amongst others. [10] It is also known in different parts of the world with different names such as *manzanita* (Filipinos), *baer*, *badari* (Hindi), *ber* (Urdu) *bidara*, *jujub* (Malaysian) *Indischer Jujubenstrauch* (German), to mention a few [10]. It is generally known as *magarya* (Hausa) in northern Nigeria [14]. It is the most popular specie of the genus and is distributed in the Sahelian region of Africa, warm-temperate and subtropical areas worldwide. According to agroforest database version 4, the documented specie is found in Asian countries (such as Afghanistan, Bangladesh, India, Indonesia Malaysia, China etc), African countries (Algeria, Kenya, Libya, Uganda, Egypt, Tunisia, etc) and Australia. Those are the native ecosystem of the plant. Furthermore, the non-native ecosystem of the plant includes countries like Angola, Burkina Faso, Cameroon, Chad, Nigeria, Philippines, and Zimbabwe, amongst many others[10].

It is a shrub or small tree bearing spines that are evergreen throughout the year. It usually grows up to 7-15 m tall, with a trunk radius of 15-20 cm or more. It has many drooping branches, paired brown spines and a spreading crown with irregularly fissured dark grey or drab black bark. In severe climatic conditions it becomes compacted and barely grows to 3-4 m tall [10,15]. The tree grows rapidly with a 25-year average bearing life [14]. The leaves are variably alternating, length up to 25-60 by 15-50 mm, with round-tip and marginally rough base. There is a delicately wavy tooth on the edges, bright green and hairless above; underneath are thick, white hairs that are soft. It consists of an inflorescence axillary cyme, with 7-20 flowers having 5 petals[10,16]. It has a globose or ovoid drupe fruit, up to 6 by 4 cm in cultivation. It also has smooth or rough skin, but tough and could be yellow, red or black in colour. Its flesh is whitish, crispy, and succulent, with a subacid to sweet flavour that changes to mealy when fully ripe [10, 15, 16].

Also, parts of this plant have been reported for various biological activities such as antinutrient, [17] antioxidant, [14, 18], hepato-protective [19, 20] anticancer [21], and antidiarrheal activities [14]. AqE of *Z. mauritiana* plant parts are widely used for various herbal preparations in northern Nigeria with little information about it attending toxicity, therefore this research was performed to assess the toxicological effect of the plant leaf AqEt so as to provide information and enlighten the consumers of the danger of it consumption.

MATERIALS AND METHODS

Plant material

Z. mauritiana leaves were collected from the premises of Nigeria Police Academy, Wudil, Nigeria. Authentication was performed at the Department of Plant Biology herbarium at Bayero University Kano (BUK), Nigeria, where a voucher specimen (BUKHAN 0233) was issued, then the sample plant was deposited.

Experimental animals

The Department of Physiology, BUK, provided 25 healthy albino rats of both sexes (*Rattus norvegicus*), weighing between 150 and 180 g, and aged 10 weeks. They were housed in a well-ventilated environment having temperature of 28-31℃; photoperiod of 12/12 hours light/dark and humidity of 50-55 percent. They were fed and watered as needed.

Assay kits and other reagents

Kits for assaying ALP, AST and ALT were produced by Randox Laboratories Ltd, U.K., while the kits for albumin and total protein assays were manufactured by TECO Diagnostics Anaheim, U.S.A. Randox Laboratories Limited, Co-Antrim, U.K produced the urea and creatinine assay kits. Agape Diagnostic was the manufacturer of the serum electrolyte assay kits. The rest of the reagents were of analytical grade.

Preparation of the leaf extract

The leaf extract was prepared in accordance with the methodology outlined by Owolarafe *et al* [21]. The leaves were washed, dried in the shade, then powdered with a blender. The powdered leaves measuring 400 g was then extracted in 1.5 L of distilled water by maceration for 3 days with occasional shaking. Following that, it was filtered And the filtrate concentrated on rotary evaporator to obtain the aqueous extract (AqE).

Phytochemical screening

Qualitative and quantitative phytochemical

Volume: 3 **Issue: 2**
Year: 2022
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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

screening were carried out according to the procedures described by Owolarafe *et al*, Dyana and Kanchana, Gupta *et al*. and Somit *et al*. [21,22, 23, 24,] for the analysis and quantification of the phytochemicals in the AqE of *Z. mauritiana* leaves.

Grouping and administration of extract to the rats

Twenty-five rats were randomly divided into five groups, and each group contains five rats. The rats were daily given treatments orally for 28 days. The test groups were administered 0.5 ml of AqE of *Z. mauritiana* leaves at a dosage of 200, 400, 600 and 1000 mg/kg BW for groups 1, 2, 3, and 4, respectively. The first group, which is the control, was administered 0.5 ml of distilled water. All of the animals were sacrificed 24 hours following the 21st dosage. The Experimental Animals Ethics Committee of the university approved this protocol, with reference number PEC/HS01/000112.

The doses were obtained from the acute toxicity studies of the extracts and were calculated using the formula:

$$D = \frac{d \times w}{C}$$

where:
D: dosage volume to be administered (0.5 ml)
d: standard dose (in mg/kg)
C: concentration of the extract (mg/ml)
w: weight of the rat to be treated in kg

Tissue samples preparation and serum collection

The weight of each rat was taken and then sacrificed as described by Owolarafe *et al* [25] under chloroform anaesthesia. The blood samples were taken with anticoagulant (for haematological investigations) and with no anticoagulant (for serum analysis) for each animal in separate bottles. After the clotting of the blood, the samples were centrifuged for 5 min at 4000 rpm. The serum was carefully removed and put into sample bottles and stored frozen for further biochemical analysis. The kidneys and the liver were removed, and tissue paper was used to blot them. They were then weighed and maintained in 10% formalin prior to histological examination after the kidney capsule was removed.

Haematological, biochemical and histological analyses

All haematological analyses were performed on a haematological auto analyser (BC 2600). Kochmar and Moss [26] described the method used for the determining ALP activity, while Henry [27] described the method for determining ALT and AST. Tietz [28] method for determining total protein concentration was used. Grant *et al.* [29] method was used to determine albumin concentration. Tietz [28] described the protocol for determining the electrolytes; Fossati *et al*. [30] method was used for determining urea concentration. The procedure of Newman and Prince[31] was employed for determining creatinine concentration (1999) while the procedure of Esterbauer *et al* [32] was adopted for MDA determination (1991). The liver and kidney were histopathologically examined using the Haematoxylin and Eosin staining technique as described by Owolarafe *et al.* [25], assessed with a Leica DM750 microscope (x100 magnification), and snapshots taken with a Leica ICCSOHD camera.

Statistical analysis

The data was presented as a mean ± standard error of mean. One-way ANOVA (analysis of variance) was used to analyse the data, and a $P < 0.05$ value was considered statistically significant. For statistical analysis and table creation, Microsoft Excel 2007 and Graphpad Instat version 3.05 were used.

RESULTS

The phytochemical constituents of leaf extract of Z. *mauritiana* plant is presented in Table 1. The AqE of the leaves showed the existence of alkaloids, saponins, tannins, glycosides, triterpenes, flavonoids, phenols, and steroids, while anthraquinone is absent. The quantification of phytochemicals present in the AqE of Z. *mauritiana* leaves is presented in Table 1 below. It revealed that tannins was the highest followed by phenol content while alkaloids were found to be the lowest (2.095 ug/ml).

Determination of yield and acute toxicity of crude extract of *Z. mauritiana* leaves

The percentage yield for the aqueous extract is 8.5%, while acute toxicity of the AqE of *Z. mauritiana* leaves is presented in Table 2. It shows that the extract is not toxic at 5000 mg/kg body weight with little or no sign of toxicity in behaviours exhibited after administration. The effect of the crude aqueous extract of *Z. mauritiana* leaves on haematological parameters is presented in Table 3. It indicates that there is no statistical difference in all the treated groups (TGs) for red blood cell, packed cell volume, haemoglobin concentration, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration and mean corpuscular volume in comparison to the control group (CG).

Volume: 3 **Issue: 2**
Year: 2022
DOI: 10.53811/ijtcmr.1056770

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 1. Qualitative and quantitative phytochemical composition of aqueous extract of *Z. mauritiana* leaves

S/N	Phytochemicals	Qualitative	Quantitative	
1	Alkaloids	√	Alkaloids (µg/ml antropine equivalent)	2.095± 0.01
2	Saponins	√	Saponins (µg/ml diosgenin equivalent)	78.29 ± 3.38
3	Glycosides	√		
4	Triterpenes	√		
5	Phenols	√	Phenols (mg/ml gallic acid equivalent)	2.20 ± 0.03
6	Tannins	√	Tannins (mg/ml tannic acid equivalent)	2.47 ± 0.03
7	Flavonoids	√	Flavonoids (mg/ml rutin equivalent)	2.095 ± 0.01
8	Steroids	√		
9	Anthraquinones	*		

Note: √ indicates presence while * indicates absence. N= 3, X ± SEM

Table 2. Acute Lethal effect of aqueous leaf extract of *Z. mauritiana*

Experiment	Dose (mg/kg body weight)	Number of dead rats after 24 hours	Number of rats after 24 hours	Symptoms
Phase I control	0	0/3	0/3	Nil
	10	0/3	0/3	Nil
	100	0/3	0/3	Nil
	1000	0/3	0/3	Corner sitting
Phase II Control	0	0/1	0/1	Nil
	1500	0/1	0/1	Nil
	3000	0/1	0/1	Nil
	5000	0/1	0/1	Corner sitting

(*Experiment was conducted in two phases; each dose group of phase-1 made up of 3 rats while those in phase 2 have 1 rat per group)

The WBC concentration revealed no difference in all the TGs except group 3 administered with 400 mg/kg which exhibited an increase in concentration which is statistically significant, there were no significant differences in lymphocytes, neutrophils, platelets and average of monocytes, eosinophils and basophils (MID) concentrations in comparison to the CG.The effect of the crude AqE of Z. *mauritiana* leaves on liver function parameters as presented in Table 4 shows that there is no statistical change in all the treated groups for AST, ALT and GGT activities in the serum when compared with the CG, except serum GGT in group 3 (400 mg/kg) which shows an increase and statistically different.

MDA, total protein, albumin, and globulin concentrations reveal no significant difference while the organ body weight ratio for the liver indicates that groups 2,3,4 are statistically different from the control group and group 5 (1000 mg/kg).

The effect of the crude aqueous leaf extract of *Z. mauritiana* on kidney function parameters, as presented in Table 5, shows that there is a statistically significant decrease in creatinine levels between the CG and the TGs while a statistically significant increase was detected in group 3 that were given 400 mg/kg body weight for serum urea concentration. The serum Na^+ levels show a significant difference between the administered groups with a statistically significant decrease was observed in groups 4 and 5 while no difference was detected for Ca^{2+} levels in the serum. The K^+ levels reveal significant decreased concentration in all administered groups at $P < 0.05$ also there were statistically a significant difference between group 4 and 5, while there were no considerable difference in chloride concentration between the CG and the TGs. The levels of HCO_3^- in the serum revealed a statistically significant rise in all TGs when compared with control while there is no difference in the values of the administered groups and the control group in the kidney BW ratio for all TGs and control.

Volume: 3 **Issue: 2**
Year: 2022
DOI: 10.53811/ijtcmr.1056770

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 3. Effect of Aqueous leaf extract of *Ziziphus mauritiana* on some haematological parameters of Wistar rats

Parameters	*Ziziphus mauritiana* Aqueous leaf extract (mg/kg body weight)				
	Control	200	400	600	1000
Hemoglobin (g/L)	14.20 ± 0.61 [a]	12.62 ± 0.91 [a]	13.22 ± 0.11 [a]	15.38 ± 1.33 [a]	14.38 ± 0.28 [a]
Red blood cell ($\times10^{12}$/L)	6.69 ± 0.23 [a]	6.27 ± 0.37 [a]	6.58 ± 0.10 [a]	7.16 ± 0.57 [a]	7.17 ± 0.13 [a]
Packed cell volume (%)	40.24 ± 1.40 [a]	36.00 ± 2.03 [a]	37.94 ± 0.49 [a]	43.72 ± 2.86 [a]	40.66 ± 0.24 [a]
Mean Corpuscular Hemoglobin (pg)	21.20 ± 0.35 [a]	20.04 ± 0.29 [a]	20.38 ± 0.39 [a]	21.38 ± 0.13 [a]	19.84 ± 0.15 [ab]
Mean Corpuscular Hemoglobin Concentration(%)	35.24 ± 0.26 [a]	34.88 ± 0.53[a]	35.34 ± 0.29 [a]	34.96 ± 0.0.68 [a]	35.30 ± 0.48 [a]
Mean Corpuscular Volume(fl)	60.24 ± 0.88 [a]	57.60 ± 0.52 [a]	57.80 ± 1.45 [a]	61.38 ± 0.87 [a]	57.58 ± 0.69 [a]
White Blood Cell ($\times10^{9}$ /L)	11.22 ± 0.20 [a]	11.50 ± 2.48 [a]	22.24 ± 1.31 [b]	12.12 ± 2.04 [a]	11.18 ± 0.37 [a]
Lymphocytes ($\times10^{9}$/L)	68.40 ± 2.75 [a]	58.60 ± 0.68 [b]	61.20 ± 3.43 [a]	65.20 ± 3.14 [a]	64.52 ± 1.84 [a]
Neutrophils ($\times10^{9}$/L)	23.60 ± 2.21 [a]	33.00 ± 0.89 [b]	28.60 ± 3.04 [a]	28.40 ± 5.97 [a]	28.44 ± 1.14 [a]
MID (%)	8.00 ± 0.55 [a]	8.40 ± 0.25 [a]	10.20 ± 0.49 [a]	10.40 ± 0.93 [a]	10.02 ± 0.53 [a]
Platelets ($\times10^{9}$/L)	507.20 ± 55.59[a]	548.00 ± 6.95[a]	416.20 ± 19.71 [a]	370.60 ± 42.85 [a]	444.40 ± 9.57 [a]

Note: MID is the average of monocytes, eosinophils, basophils. N=5, X±SEM.[a-c] test values carrying superscripts different from the control across each parameter are significantly different at $P < 0.05$.

Table 4. Effect of aqueous leaf extract of *Ziziphus mauritiana* on some Liver Function Indices of Wistar rats

Parameters	*Ziziphus mauritiana* aqueous leaf extract (mg/kg body weight)				
	Control	200	400	600	1000
Aspartate aminotransferase(U/L)	31.48 ± 1.02 [a]	32.64 ± 2.14 [a]	35.52 ± 1.91 [a]	32.06 ± 4.18 [a]	22.52 ± .91 [a]
Alanine aminotransferase (U/L)	12.49 ± 0.37 [a]	12.072 ± 0.51 [a]	13.89 ± 0.758 [a]	12.55 ± 1.52 [a]	11.97 ± 0.69 [a]
Gamma Glutamyl transferase (U/L)	3.47 ± 1. 50 [a]	2.55 ± 1.39 [ab]	10.42 ± 3.07 [b]	4.01 ± 1.67 [ab]	1.27 ± 0.12 [a]
Malondialdehyde (nmol/ml) X 10^{-7}	7.67 ± 0.96 [a]	10.83 ± 3.28 [a]	6.68 ± 1.34 [a]	5.37 ± 0.79 [a]	4.87 ± 0.99 [a]
Total Protein (g/dL)	7.58 ± 0.66[a]	7.603 ± 0.78 [a]	8.04± 0.39 [a]	8.65 ± 0.71 [a]	6.879 ± 0.08 [a]
Albumin (g/dL)	2.18 ± 0.26 [a]	1.76 ± 0.12 [a]	1.21± 0.04 [ab]	1.515 ± 0.04 [a]	1.61 ± 0.22 [a]
Globulin (g/dL)	5.40 ± 0.45 [a]	5.84 ± 0.77 [a]	6.83 ± 0.38 [a]	7.14 ± 0.68 [a]	5.26 ± 0.23 [a]
Liver-body weight ratio (%)	6.10 ± 0.27 [a]	5.32 ± 0.15 [b]	4.86 ± 0.19 [b]	5.18 ± 0.13 [b]	3.71 ± 0.08 [c]

N = 5, X ± SEM.[a-c] test values carrying superscripts different from the control across each parameter are significantly different at $P< 0.05$

Table 5. Effect of aqueous leaf extract of *Ziziphus mauritiana* on some Kidney Function Indices of Wistar rats

Parameters	*Ziziphus mauritiana* aqueous leaf extract (mg/kg body weight)				
	Control	200	400	600	1000
Creatinine (umol/L)	2.53 ± 0.37 [a]	0.18 ± 0.08 [b]	0.74 ± 0.25 [b]	0.41 ± 0.14 [b]	1.03 ± 0.38 [b]
Urea (mmol/L)	9.72 ± 1.79 [a]	7.55 ± 0.44 [a]	13.91 ± 1.00 [b]	12.15 ± 1.15 [a]	10.17 ± 1.62 [a]
Sodium (mEq/L)	509.06 ± 31.73 [a]	480.30 ± 21.44 [a]	431.74 ± 18.48 [a]	358.19 ± 6.42 [b]	347. 06 ± 8.55 [b]
Calcium (mg/dL)	4.52 ± 1.22[a]	2.06 ± 0.42 [a]	3.80 ± 0.22 [a]	3.28 ± 0.59 [a]	3.67 ± 0.41 [a]
Potassium(mEq/L)	3.43 ± 0.30 [a]	2.02 ± 0.14 [b]	1.85 ± 0.27 [b]	0.99 ± 0.07 [bc]	2.18 ± 0.27 [bd]
Chloride (mEq/L)	130.35 ± 11.85 [a]	121.19 ± 11.33 [a]	104.89 ± 3.29 [a]	91.85 ± 3.01 [ab]	102.26 ± 3.80 [a]
Bicarbonate (mmol/L)	10.51 ± 0.49 [a]	11.99 ± 0.28 [b]	12.32 ± 0.39 [b]	13.544 ± 0.08 [b]	12.526 ± 0.30 [b]
Kidney-body weight ratio (%)	0.69 ± 0.01 [a]	0.73 ± 0.03 [a]	0.61 ± 0.02 [a]	0.72 ± 0.03 [ab]	0.72 ± 0.02 [ab]

N = 5, X ± SEM.[a-c] test values carrying superscripts different from the control across each parameter are significantly different at $P < 0.05$

Volume: 3 **Issue: 2**
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The histopathological evaluation of the liver cell architecture revealed a normal cellular architecture for Figure 1a (control) with all the portal triad in position while Figure 1b (200 mg/kg) is showing mild degeneration of liver tissue structure. Figure 1c (400 mg/kg) reveals a mild inflammation of liver tissue which was not severe while Figures 1d and 1e (600 and 1000 mg/kg) exhibit no significant pathology of the liver tissue.

The kidney cell architecture revealed a normal cellular architecture for Figure 2a (control) with all showing renal tubules intact while Figures 2b and 2c (200 mg/kg and 400 mg/kg) are showing mild dilation of the renal tubules. Figures 2d and 2e (600 and 1000 mg/kg) exhibit no significant dilation.

DISCUSSION

Plants synthesize a wide range of chemical substances, some of which have been described to be very important in treatment of several diseases. The extraction of these secondary metabolites is based on their ability to dissolve in various solvents [33]. The therapeutic benefit of plants lies in their phytoconstituents that have a definite physiological action on human beings [34]. Over the years, several researches have shown that these phytoconstituents exhibit biological actions for example antimicrobial [35], antifungal [36], antioxidant, anticancer [11] and hepatoprotective [37], while other researchers have reported that these bioactive principles exhibit toxic effects such as hepatotoxicity [38] and nephrotoxicity [39]. Some of the active phytochemicals that have been identified in this study include alkaloids, glycosides, flavonoids, terpenoids, saponins, steroids and phenols (Table 1). The saponins concentration is the highest with alkaloids as the lowest (Table 1). Saponins have been reported to exhibit some physiological actions which are both beneficial and detrimental; these activities are exhibited in various biological systems such as microbes, molluscs, herbivores, and humans [40]. These effects include abortifacient, antizygotic, anti-implantation [41], haemolytic [42], hypoglycaemic, cholesterol-lowering, [43, 41] and respiratory epithelia-damaging effects [44].

Acute toxicity is used to calculate the LD_{50}, which is the dose that has been shown to cause death (lethal) in 50% of the animals tested. In determining acute oral toxicity, usually the first step is assessing and evaluating the toxic characteristics of all compounds[45,46]. Currently, there has been a rise in public responsiveness and awareness in therapeutic plants and their preparations, also called herbal medicines. [47] However, the lack of scientific and clinical data to back up traditional healers' claims of efficacy and safety is a major roadblock [45]. *Ziziphus mauritiana* Leaf aqueous extracts are considered practically nontoxic.

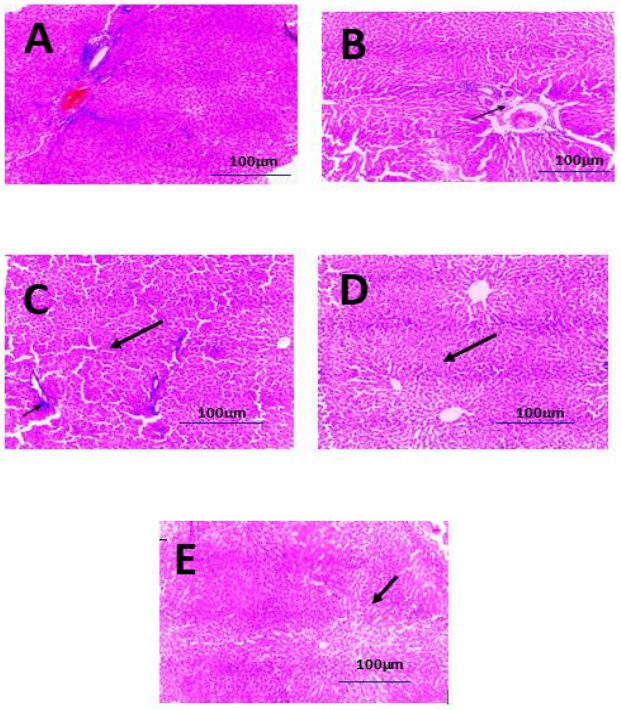

Figure 1. Photomicrographs cross section of Liver of Wistar rats administered with distilled water (A), 200 mg/kg(B) 400 mg/kg (C) 600 mg/kg (D) and 1000 mg/kg €body weight of Aqueous leaf extract of *Ziziphus mauritiana* orally for 21days (X 100) haematoxylin and eosin.

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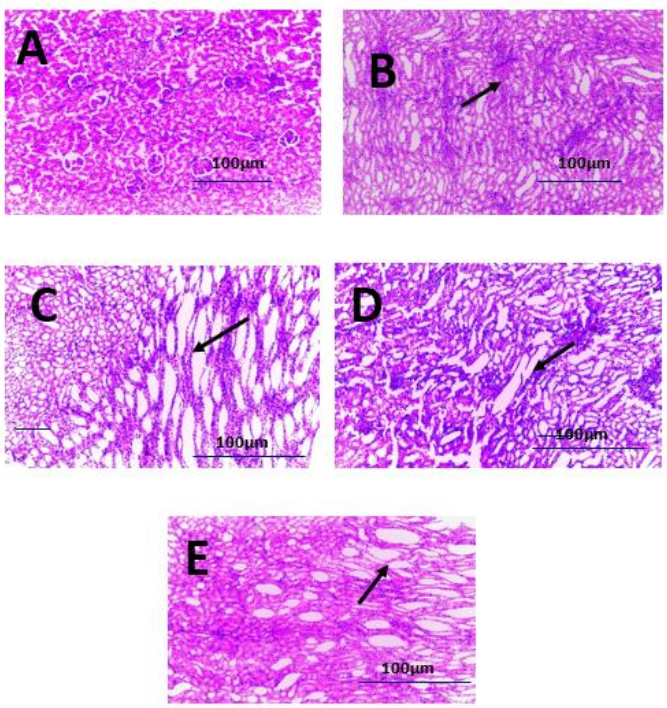

Figure 2. Photomicrographs cross section of Kidney of Wistar rats administered with distilled water (A) 200 mg/kg (B), 400 mg/kg (C), 600 mg/kg (D), 1000 mg/kg (E) body weight of Aqueous leaf extract of *Ziziphus mauritiana* orally with for 21 days (X 100) haematoxylin and eosin.

Subchronic administration of AqE of *Ziziphus mauritiana* leaves on wistar rats

Subchronic toxicity testing of plant extracts by determining their effect on specific blood, biochemical, and morphological composition of major or precise tissues, particularly the liver and the kidneys, can offer beneficial information about the toxicity mechanisms of an extract that is otherwise thought to be a safe medicinal agent[48].

Haematological analysis in animal toxicity studies is important to understand the condition and any pathology as a result of ingestion of chemicals or infection and assess the danger to the hematopoietic system in order to extrapolate these findings when considering the use of these extracts as a therapeutic agent for humans [49,50,] The increase in some haematological parameters upon administration of aqueous extracts of *Z. mauritiana* leaf (PCV, MCV and lymphocytes) which were not statistically different maybe an indication corroborating non-toxic observation made in the acute toxicity evaluation (Table 3**)** [51] but Statistically significant increase in WBC concentration give an opposing suggestion which may be due to toxicity of certain phytoconstituents within the AqE which maybe effecting an inflammatory response in the biological system[52] . The liver function indices are parameters for measuring the functional status of the liver [53]. The elevation of transaminases characterises liver diseases and dysfunction due to toxic compounds. GGT, a cholestatic enzyme, is mainly an affirmation parameter for liver dysfunction because it is found predominantly in the liver and its elevated activity in the serum is a clear sign of damage of the hepatocyte cell membrane [54, 55]. No considerable difference ($P<0.05$) in these parameters between the CG and the TGs indicating that the AqE of *Z. mauritiana* leaves may not be toxic and its therapeutic importance may be explored advantageously because these parameters were affected significantly. The glomeruli in the kidney filter a wide variety of substances from the plasma endogenously, including electrolytes, urea, creatinine, and proteins, etc. and its inability to perform this important function leads to elevation of these metabolites in the system[56, 57, 39]. The alteration in the kidney function parameters could be a sign of the adversity of the AqE administration[56]. The reduction in serum Na^+ concentration could be due to an extreme loss of body fluid (sweat) from the body fluid or decreased production of aldosterone which aids membrane aldosterone involved in the stimulation of Na^+ /H^-

exchanger to other mineral corticoids responsible for sodium ion reabsorption [58]. This is corroborated by decreased serum potassium concentration which is an observation inimical to the sodium pump that controls the extracellular potassium concentration[59]. A rise in serum bicarbonate ions could be useful in evaluating renal function; thus, the significant rise in serum bicarbonate ions at all the dosages studied could be a sign of tubular glomerular dysfunction[57]. Protein catabolism produces urea, which is the primary nitrogen-containing metabolic product and its measurement along with creatinine in the plasma will also indicate renal dysfunction [60]. The significant reduction in serum creatinine concentration and an increase in urea concentration which are not statistically significant different from control except 400 mg/kg bd wt after the administration of leave extract of *Z. mauritiana* at doses administered may be attributed to the inability of the kidney to take care of the by-product of the urea cycle at the observed dose [61]. This may indicate that the aqueous extract may contain nephrotoxic phytoconstituents. Alteration in the morphology of the hepatocytes and cells of the kidney in terms of size and component structure is usually confirmatory biomarkers for dysfunction of the organs [38, 62]. The changes observed in the microscopic presentation of liver and kidney in all groups when compared with the control which presented all portal triad in their position(Liver) and intact renal tubules (Kidney) while the treated groups exhibited mild vascular congestion and inflammation (Liver) and mild dilation of the renal tubules maybe a confirmatory parameter especially in the liver and kidney functionality.

CONCLUSION

Based on the observed result we may conclude that this extract may be regarded as mildly toxic over the period of administration and prolonged administration of this extract may lead the severe adverse effects on the biological system.

Conflict of interest: No conflict of interest is declared by the authors.

Author contributions: Design, Writing, Experimental Procedure: [OTA, IGO]; Statistical analysis: [SK, OCJ], Experimental parameter analysis: [MB], Similarity checks: [FM]

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CASE REPORT

Usefulness Of Homoeopathic Medicine in Oppositional Defiant Disorder (ODD):A Case Report

S Karunakara Moorthi[1*], Radhika Prasannakumar[1]

[1]National Homoeopathy Research Institute in Mental Health, Kottayam, India

* Corresponding Author: Dr.S.Karunakara Moorthi, e-mail: dr.karunakaramoorthi@gmail.com

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Abstract
Oppositional Defiant Disorder (ODD) is a disruptive behavioural disorder in which a child displays a pattern of an angry mood, defiant or combative behaviour, and vindictiveness toward people in authority. The child's behaviour often disrupts their daily routine, including activities within the family and at school. An 18-year-old male reported in the Out Patient Department with symptoms of anger and vindictiveness. The consultant psychiatrist diagnosed it as a case of Oppositional Defiant Disorder (ODD). Disruptive Behaviour Disorder Rating Scale (DBDRS) – ODD items was used to assess the severity of the disease. Modified Naranjo Criteria was used to assess whether the changes were likely to be associated with the homoeopathic intervention. Overall improvement was noticed clinically. DBDRS score was 22 at the time of admission. *Sepia* 200 was selected as the individualized homeopathic medicine. His symptoms got improved and he was discharged. DBDRS score was reduced to 0 at the end of 16 months. Individualized homoeopathic treatment has shown a positive role for the management and treatment of disruptive behavioural disorder.
Keywords: Oppositional Defiant Disorder, Homoeopathy, Psychiatry, Sepia, Natrum Muriaticum, DBDRS.

INTRODUCTION

Oppositional Defiant Disorder (ODD) is identified by persistent defiant, noncompliant, and antagonistic behavior and by persisting irritability and anger. It usually has an early onset in childhood. Although often being recognized as a disorder of childhood, ODD persists into adulthood. ODD pervasively impairs functioning over the life span, causing difficulties in interpersonal relationships and social functioning, academic and occupational functioning, and in familial relationships.[1]

According to the Diagnostic and Statistical Manual of Mental Disorders-5 [2], for the diagnosis of ODD, at least 4 among the following symptoms should persist for at least 6 months:

Angry/Irritable Mood

1. Often loses temper.
2. Is often touchy or easily annoyed.
3. Is often angry and resentful.

Argumentative/Defiant Behavior

4. Often argues with authority figures or, for children and adolescents, with adults.
5. Often actively defies or refuses to comply with requests from authority figures or with rules.
6. Often deliberately annoys others.
7. Often blames others for his or her mistakes or misbehavior.

Vindictiveness

8. Has been spiteful or vindictive at least twice within the past 6 months.[2]

Community samples show a prevalence rate for ODD ranging between 2 and 14 %.

The disorder is more prevalent in boys than in girls with ratio ranging from 3:1 to 9:1.[3] A prevalence study conducted in India found that the prevalence of ODD among primary school children was found to be 7.73% with male and female being equally affected.[4] Srinath et al reported a point prevalence for conduct and oppositional defiant disorder to be 1.3%.[5]

A meta-analysis by Angold et al indicated that Conduct Disorder, Attention Deficit Hyperactivity Disorder (ADHD), depressive disorder and anxiety disorders co-exist with ODD.[6] The estimated prevalence of ODD in clinical ADHD samples is around 50%, much higher than in the general population.[7] Kadesjo et al comparing children with

Volume: 3 **Issue:** 2
Year: 2022
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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

ADHD with and without ODD found that the ADHD combined sub-type with higher severity of ADHD symptoms were seen more often in the comorbid group.[8]

There are multiple risk factors related with the etiology of ODD. The role of genetics, neuroanatomy and neurochemistry have been suggested. Research established the association between familial negativity and adolescent antisocial behavior, although a modest effect for nonshared familial environment was also found.[9]

Lower socioeconomic status has shown a strong association with children's behavioral problems. Parenting style has also shown a strong association with children's behavioral problems, especially with ODD. Parenting behavior and socioeconomic status seems also related to each other. A link was found between economic stress in family life and adolescent internalizing and externalizing behavioral symptoms.[10]

The association between neuroanatomical regions and disruptive behaviour is still under research. Both the meta-analytic and narrative reviews showed evidence of smaller brain structures and lower brain activity in individuals with ODD/CD in areas like: bilateral amygdala, bilateral insula, right striatum, left medial/superior frontal gyrus, and left precuneus.[11]

During the past decade, increasing attention has been given to the study of neurochemistry associated with Disruptive Behavioural Disorders. Serotonin has been, to a large extent, linked to aggressive behaviour. Low levels of a serotonin metabolite (5-hydroxy-indoleacetic acid) in cerebrospinal fluid have been linked to concurrent and future aggression in children. The link between serotonin and aggression likely reflects a more complex relationship between neuroanatomical and neurochemical interconnectivity, executive brain function, and behavioural dysregulation. Low levels of salivary cortisol and increased testosterone has also been associated with aggressive behaviour.[12]

Some researchers maintain that ODD is a relatively benign disorder with good prognosis.[13] Factor analysis and other studies suggest that if behavioural and emotional symptoms of ODD persists or worsen, it may predict later development of behavioural and emotional disorders such as depression, anxiety, ADHD or conduct disorder.[14,15]

Individuals with both ADHD and ODD have a considerably worse prognosis than individuals with either one of the disorders in terms of an increased risk to develop anxiety and depressive disorders as well as conduct disorder and even antisocial personality disorder later in life.[16,17] This, in turn is related to high rates of domestic violence, unemployment and homelessness. Functional outcomes associated with ODD through childhood and adolescence include conflict within families, poor peer relationships, peer rejection and academic difficulties. Little examination of functional outcomes in adulthood associated with ODD has been undertaken.[18,19]

The impairment associated with behavioral disorders in childhood may persist through adolescence and adulthood, which places youth on a path for future school drop-out, substance use, delinquency, incarceration, criminal behaviors, and premature death. Disruptive behaviors may also lead to maternal stress, which may result in poor parenting, further contributing to children's emotional difficulties.[20]

The Disruptive Behaviour Disorder Rating Scale (DBDRS) is a screening tool designed to aid in the diagnostic process for a number of child psychopathologies, particularly externalizing disorders. The DBD rating scale consists of 45 items related to symptoms of Conduct disorder (16 items), ODD (8 items), ADHD-Inattention (9 items), ADHD- hyperactivity/ Impulsivity (9 items). These items relate directly to the 36 DSM-III-R diagnostic criteria for Conduct Disorder, Oppositional Defiance Disorder and Attention Deficit Hyperactivity Disorder and are randomly ordered across diagnostic categories. Each item is rated on a four-point scale ranging from not at all (0), just a little (1), pretty much (2) to very much (3).[21]

The Modified Naranjo Criteria for Homeopathy—Causal Attribution Inventory was used for assessing the likelihood of a causal relationship between a homeopathic intervention and clinical outcome. The strength of association between the medicine and outcome was assessed by the following criteria: definite: ≥ 9; probable 5-8; possible 1-4; and doubtful ≤ 0.[22]

Homoeopathy is a system of medicine which is beneficial in mental disorders. Few case reports had been published and it shows that there is a positive role for homoeopathy in the management of ODD and CD cases.[23,24,25]

CASE PRESENTATION

Presenting complaints

Angered easily

- Arguing and stubborn.
- Abusive

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1121166

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

- Quarreling tendency with parents
- Threatening and striking his parents occasionally.
- Indifferent attitudes to family members.

A boy aged 18 years, was brought to the Out Patient Department of a tertiary care hospital in South India with above complaints presenting since 1 year. He got admitted in the In-Patient Department from 6/10/2017 to 12/12/2017.

History of presenting complaints

Since childhood, his parents were very strict and dominating. They didn't give freedom to him and he had to follow their commands without any objection. So, he had to lose his friends and enjoyments as he wishes. He started to show defiant behavior since childhood, but the complaints have got aggravated for an year.

He had a love affair, when he was studying in higher secondary school, but his mother gave many reasons for rejecting her and he had to drop the relationship. Henceforth, he developed severe anger towards his parents and frequently argued with them over trivial matters. He started to contradict them and compelled them to fulfill his wishes immediately without taking into concern their financial background. When his wishes were not complied, he used to threaten them like, he is going to die or leave home. He scolded his parents in a disrespectful way. He used to beat them occasionally. When they tried to console him, his anger became more severe and he replied to them he was retaliating.

Treatment history

Not taken any treatment yet.

History of past illness

Nothing particular.

Family history

No relevant psychiatric complaints noted in family.

Life space investigation

Patient hailed from a middle-class family in South India. He was the eldest among two children. He was brought up by his parents. He was average in studies. He didn't have any interest in extracurricular activities. He had an indifference towards his family members.

His father was an occasional drinker. But he didn't make any disputes because of that nor affected the family environment. Mother has short temper and quarrels frequently with everyone at home for trivial things. She is strict in all aspects, which caused the child to suppress his anger.

Physical generals

He has craving for sour. He has profuse sweat on palms. Thermally he was chilly.

Clinical findings (mental status examination baseline)

It is represented in Table 1.

Table 1. Mental Status Examination

S. No	Domains	Before treatment	After treatment
1	**General appearance and behavior**	Conscious, aware of his surroundings, poorly kempt, hair was untidy, lean built. Rapport: Not established. Eye to Eye Contact: Maintained Inter Personal Relationship: Poor	Conscious, aware of his surroundings. Well kempt. Hair neatly combed. Lean built. Rapport: established. Eye to Eye Contact: Maintained. Inter Personal Relationship: improved well
2	**Psychomotor activity**	NAD	NAD
3	**Speech**	Normal	Normal
	Tone	Irritable	Normal
4	**Affect**	Appropriate	Appropriate
5	**Mood**	Subjective: Irritable Objective: Irritable	Subjective: Euthymic Objective: euthymic
	Thoughts	NAD	NAD
6	**Perceptual disorders**	Nil	Nil
	Hallucinations	Nil	Nil
	Illusions	Nil	Nil
7	**Orientation to**	Well oriented to time, place and person	Well oriented to time, place and person
8	**Memory**	Good	Good
9	**Attention and concentration**	Good	Good
10	**Abstract thinking**	Good	Good
11	**Judgement**	Social judgement: Poor. Test judgement: Good	Social judgement: Good Test judgement: Good
12	**Insight**	Complete denial of illness	Aware of his illness

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1121166

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

TIMELINE

The follow up of the case is depicted in Table 2.

Table 2. Two years follow- up of the case.

SL NO.	DATE	SYMPTOMS	HOMOEOPATHIC PRESCRIPTION
1.	**06/10/2017**	Angered easily. Arguing and stubborn. Abusive. Quarreling tendency with parents. Threatening and striking his parents occasionally. Indifferent attitude to family members.	Sepia 200/1D repeated once in a week for a month.
2.	**02/01/2018**	Complaint of getting angry easily was reduced. Arguing and stubbornness were reduced. Abusive tendency reduced. Quarreling tendency with parents was present on and off. No tendency to threaten or strike his parents. Indifferent attitude to family members-reduced.	Totally 6 doses of Sepia 200 were prescribed. Advised to stop the medicine once complaints felt better, and asked them to keep the rest of the medicine as S.O.S.
3.	**10/04/2018**	Neatly dressed and well kempt. Anger outburst reduced well. Arguing and stubbornness were reduced well. Started establishing rapport. Abusive-reduced well. Quarreling tendency with parents-reduced. Threatening and striking his parents-Nil. Indifferent attitude to family members-reduced well.	He had taken all the 6 doses. So, Sepia 200/6D were repeated and advised to stop when he feels better/ improved.
4.	**05/07/2018**	Neatly dressed and well kempt. Anger-on and off. Amelioration of arguing and stubbornness. Abusive-reduced well. Quarreling tendency with parents-reduced. Rapport established with the examiner. Threatening and striking his parents-Nil. Indifferent attitude to family members-reduced well.	Whenever he stopped taking Sepia 200, his complaints were reappearing, but with less intensity. So, Sepia 1M /3D were given as S.O.S followed by placebo.
5.	**09/10/2018**	Neatly dressed and well kempt. Anger-Under control. Arguing and stubbornness -reduced but still persist. Not abusive. Rapport established with the examiner. Quarreling tendency with parents-reduced well. Threatening and striking his parents-Nil. Indifferent attitude to family members-reduced well.	He had taken 2 doses and felt much better. Sepia 1M/3D prescribed.
6.	**08/01/2019**	Complaints were reduced well. He happened to meet his ex-lover. Henceforth, he felt disappointed, and wept in his room. Constant thoughts of her.	Natrium mur 200/4D were prescribed.
7.	**09/04/2019**	All his complaints were reduced and felt much better than before.	Sepia 1M/ 3D were prescribed as S.O.S but he hadn't taken it.
8.	**04/07/2019**	All his complaints were reduced and felt much better than before.	Sepia 1M/ 3D were prescribed as S.O.S but he hadn't taken it.
9.	**08/10/2019**	Generally better. Attending job regularly without any behavioural issues. Had Adequate inter- personal relationship.	Sepia 1M/ 3D were prescribed as S.O.S but he hadn't taken it.
The patient is still continuing regular OPD follow-up. No behavioral changes were reported. He has been fully functional in family and occupationally. Occasionally, *Sepia* and *Nat mur* were prescribed, according to his complaints, to prevent any deterioration.			

DIAGNOSIS ASSESSMENT

Consultant Psychiatrist diagnosed the case based on Diagnostic and Statistical Manual of Mental Disorders-V criteria for ODD.

THERAPEUTIC INTERVENTION

Individualized homoeopathy medicine was administered to the patient. Considering the causative factor, mental and physical generals,

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1121166

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

totality was erected. Repertorization was done using Synthesis Repertory. Repertorisation is the specific technique of taking the "totality of symptoms" of a given disease and then using a compilation of these indications, cross-referenced to medicinal agents, to find the curative remedy for the given disease. Repertorization chart is depicted in Figure 1.

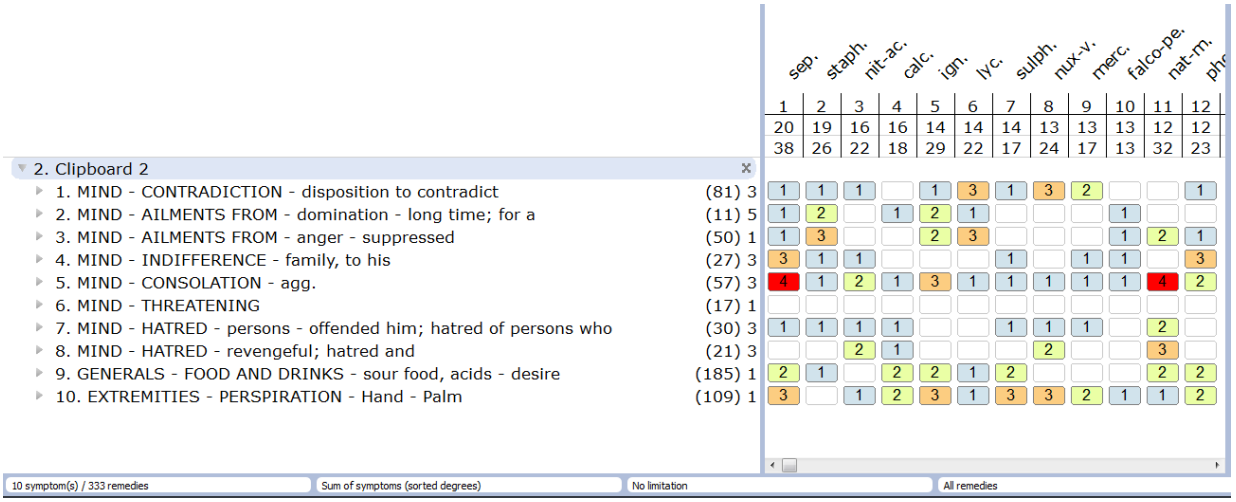

Figure 1. Repertorization chart

Sepia, Staphysagria and Nitric acid were the first three remedies. Sepia was selected based upon the strong indifferent attitude towards the family members, easily offended nature, causative factor, perspiration of palms and thermally chilly.

Since the causative factor of Staph. like ill effects of anger and insult, anger outburst with throwing things, sensitive to the opinion of others were not matching with the constitution of the patient. So, Staph. was avoided.

Even though Nitric acid has covered symptoms of the patient like irritability, unforgiving nature and vindictiveness, the causative factor is not covered by *Nit acid*.

Sepia 200 CH and 1M potency were prescribed and repetition was done when needed.

Patient improved well symptomatically. In between, he was complaining of sadness, thoughts about his disappointed love, desire to be alone, and weeping when alone. So, he was prescribed a dose of *Nat mur* 200 CH. *Nat mur* is complementary to *Sepia* and was covering the symptoms of the patient.

DISCUSSION

Psychosocial theorists have hypothesized that certain social stressors or situations can contribute to the development of the disorder. These include parental problems in disciplining and limit setting with the child (i.e., too lenient, too strict, or inconsistent), parent-child attachment deficits, or identification with an impulse-disordered parent.

The reason for the development of the psychopathology of ODD in this case could have been parental domination as well as unrevealed verbal emotions. The derangement of the personality has affected the social, occupational and familial life of the patient.

"*Unexpressed emotions will never die. They are buried alive and will come forth later in uglier ways*." This is a meaningful quote by Sigmund Freud, the father of psychoanalysis. The significance of the quote can be related to the situation of the patient in this case report. Since childhood, he was suffering from domination and never got a chance to fulfil to his childish aspirations. As a child, he was not able to verbalize or express his disapproval to his parent's behaviour. His mother revealed that, patient never spoke about his feelings with them. Gradually, he developed defiant behaviour, which got worse when his mother insisted separation from his girlfriend. So, the defiant behaviour escalated to abusiveness, frequent arguments and even hurting tendency to parents occasionally.

Disruptive Behaviour Disorder Rating Scale (DBDRS) was used at baseline, and every six months for 2 years. It scored 22 at the beginning of the treatment. Gradually, it got reduced to 0 within 1½ years treatment. Assessment of the scale is depicted in Table 3. No adjunctive therapies were given to the patient during this 2-years period.

Volume: 3 **Issue:** 2
Year: 2022
DOI: 10.53811/ijtcmr.1121166

International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

Table 3. Disruptive Behaviour Disorder Rating Scale- ODD items.

S.no	Domains	Baseline	At the end of 6th month	At the end of 1st year	At the end of 1 ½ year	At the end of 2nd year
1	Often argues with adults	3	2	1	0	0
2	Is often spiteful or vindictive	3	2	0	0	0
3	Often blames others for his or her mistakes or misbehavior	3	2	0	0	0
4	Often actively defies or refuses to comply with adults' requests or rules	3	2	1	0	0
5	Is often angry and resentful	3	2	0	0	0
6	Is often touchy or easily annoyed by others	2	1	0	0	0
7	Often loses temper	3	2	0	0	0
8	Often deliberately annoys people	2	1	0	0	0
	TOTAL	**22**	**14**	**2**	**0**	**0**

Although the study of a single case does not constitute a strong opinion, the outcome is encouraging. The causal attribution was established using the Modified Naranjo Criteria, the score was 8, i.e., 'probable' as given in Table 4.

Table 4. Assessment by Modified Naranjo Criteria during follow-up of the case

S.No	CRITERIA	Yes	No	Not Sure	Case
1	Was there an improvement in the main symptom or condition for which the homeopathic medicine was prescribed?	+2	-1	0	+2
2	Did the clinical improvement occur within a plausible Time frame relative to the drug intake?	+1	-2	0	+1
3	Was there an aggravation of symptoms?	+1	0	0	0
4	Did the effect encompass more than the main symptom or condition, i.e. were other symptoms ultimately improved or changed?	+1	0	0	+1
5	Did overall wellbeing improve?	+1	0	0	+1
6	(A) *Direction of cure:* Did some symptoms improve in the opposite order of the development of symptoms of the disease? (B) *Direction of cure:* Did at least two of the following aspects apply to the order of improvement of symptoms: - from organs of more importance to those of less importance - from deeper to more superficial aspects of the individual - from the top downwards	+1 +1	0 0	0 0	0 0
7	Did “old symptoms” (defined as non-seasonal and noncyclical symptoms that were previously thought to have resolved) reappear temporarily during the course of improvement?	+1	0	0	+1
8	Are there alternate causes (other than the medicine) that – with a high probability – could have caused the improvement? (Consider known course of disease, other forms of treatment, and other clinically relevant interventions)	-3	+1	0	0
9	Was the health improvement confirmed by any objective data?(DBDRS).	+2	0	0	+2
10	Did repeat dosing, if conducted, create similar clinical improvement?	+1	0	0	0

After homoeopathic treatment, the patient completed his studies and is now attending his job regularly. He is now cooperative and adjusts with his family as well as working situations.

CONCLUSION

Oppositional Defiant Disorder is seen to escalate to conduct disorder and anti-social personality disorder in the due course. Given the negative outcomes associated with behavioral challenges as children transit to adolescence and adulthood, detecting these emerging behavioral challenges early is critical in developing appropriate interventions. This case report shows that homoeopathy can offer a promising result in the management of ODD.

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Statement of ethics: The authors certify that, they have obtained all appropriate care- giver consent form from the parent as well as received verbal assent from the patient. The patient and care-giver understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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REVIEW

Effect of Dry Needling in Chronic Musculoskeletal Pain

Veysel Uludag[1*] Nihal Buker[2]

[1]Duzce University, Traditional and Complementary Research Center, Duzce, Türkiye
[2]Pamukkale University, School of Physical Therapy and Rehabilitation, Denizli, Türkiye

* Corresponding Author: Veysel Uludag, e-mail: vuludag1365@outlook.com

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Abstract
Pain is a sensation felt in one or more parts of the body, and it is a bad feeling that bothers people. Every person who feels pain learns about pain early in life through experiences with injury. In recent years, chronic pain has begun to be accepted as a disease rather than a symptom. Therefore, pain does not always mean tissue damage. Although scientific studies have made rapid progress in our perspective on chronic pain, the mechanisms of pain have not yet been fully explained. Though many things have been tried, the continuation of pain and the inability to fully explain the pain mechanisms have increased the interest in complementary medicine applications. It has been shown that trigger points accompany many musculoskeletal pathologies within the concept of central sensitization, which has an important role in the pathogenesis of chronic pain. Dry needling therapy in trigger point therapy is often used as a minimally invasive complementary medicine option to manage pain. In this study, information about pain was examined in the light of current literature. We aimed to review the effects of dry needling therapy on the musculoskeletal system in chronic pain disease groups from a different and up-to-date perspective. After examining the literature and the concept of chronic pain and dry needling, the following conclusion was reached; When the effectiveness of dry needling is examined in chronic painful disease groups in the musculoskeletal system, dry needling, which is a minimally invasive method, is effective, but more studies are needed.
Keywords: Chronic Pain, Central Sensitization, Dry Needling, Complementary Medicine

INTRODUCTION

The cause of pain, with its pathophysiology and mechanisms, is a special issue that has not been fully elucidated for centuries. The perception of pain is actually a subjective experience that is influenced by the complex interactions of biological, psychological, and social factors. Although the level of pain sensation of the patients may vary from person to person, it is also affected by many extrinsic and intrinsic factors. Pain is a conscious experience in the brain[1]. The International Association for the Study of Pain defines pain as an unpleasant sensory and emotional experience associated with or defined by actual or potential tissue damage[2]. Central sensitization is the increased sensitivity of pain-sensitive neurons in the central nervous system to normal or sub-threshold stimuli[3,4] .Central sensitization mechanisms have an important role in the pathogenesis of chronic pain. It has been shown to accompany trigger points in many musculoskeletal pathologies associated with central sensitization. Dry needling in trigger point therapy is often used as a treatment option to manage pain. People with low back pain, neck pain, osteoarthritis, fibromyalgia, temporomandibular dysfunction, primary dysmenorrhea, migraine and tension-type headache, persistent musculoskeletal pain have different degrees and levels of hypersensitivity problems[5]. Many pharmacological and modern treatments are used to reduce pain in patients with chronic pain. In order to manage and reduce the pain process, many complementary medicine methods (osteopathy, apitherapy, chiropractic, acupuncture, homeopathy etc.) are applied by health professionals together with modern medicine[7].

In this study, it was aimed to review the current literature on dry needling treatment in musculoskeletal patient groups with chronic pain.

Pathophysiological classification of pain

The International Association for the Study of Pain

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International Journal of Traditional and Complementary Medicine Research

Publisher
Duzce University

has identified three different mechanisms of pain. This mechanisms nociceptive, neuropathic and nociplastic types[2]. Nociceptive pain is defined as pain that occurs with the activation of nociceptors as a result of damage or risk affecting non-neural tissues. There is a mechanical, chemical and ischemic factor that activates the nociceptors in nociceptive pain transmitted to the brain through nociceptors on the nociceptive pain organ or peripheral organ or skin surfaces. There is a real risk of injury or injury affecting non-neural tissues[8]. Pain, which we can call mechanical problems and which occurs as a result of damage, can be evaluated in this group. Neuropathic pain, is defined as pain that occurs when somatosensory nerves are affected as a result of an injury or disease there is an injury, disease, pressure that affects the neural tissues. In general, allodynia may accompany, and hyperalgesia may be observed. In neuropathic pain, dermatomal/cutaneous distribution is mostly observed. The electric sensation is described as burning or aching. Neuroplastic pain, is pain caused by the sensitized nervous system without a detectable condition that fits the definitions of nociceptive and neuropathic pain. Neuroplastic pain is the type of pain used in chronic painful disease groups, which is associated with central sensitization mechanisms in the literature[8,9]. In neuroplastic pain, the central nervous system is hypersensitive, normal and sub-threshold stimuli are amplified. Normal sensory conduction and modulation are affected. The descending inhibitory pathways cannot function effectively[10]. Today, drugs are widely used as a pharmacological method in the control of pain. Another approach used in the control of pain is non-pharmacological methods. These are massage, hot pack and cold pack applications, menthol applications to the skin, vibration, transcutaneous electrical nerve stimulation, manual therapy techniques, cupping therapy, cognitive behavioral techniques, placebo effect, surgical treatment methods, nerve blocks and dry needling are applied[11].

Classification by duration of pain

The pain duration classification system is determined by the length of time a person has experienced pain. According to this classification, the basic classification is acute, subacute and chronic pain. Acute pain is short-term pain that resolves within 1 month, and is often associated with acute injury or trauma. Subacute pain means symptoms for more than 1 month but less than 3 months. Chronic pain is defined as pain that affects different systems, along with a much more complex process, and that still persists at the end of the prescribed period for the healing of tissues and this pain that lasts for 3 months or longer[2]. It should not be forgotten that every pain has an acute onset before chronic pain occurs.

Dry needling and physiological mechanism

The history of dry needling It dates back to the 1940s. Dr.Janet Travell identified and outlined the muscle trigger points that occur with "wet needling", later discovering that "dry needling" produced the same results,and hence coined the term dry needling. Thus, the first generation of modern dry needling was established[12]. The interest in dry needling in complementary medicine practices has increased in the last two decades, thanks to studies stating that the dry needling technique is simple and effective. Although the needles used during dry needling are similar to the acupuncture treatment method, dry needling is different from acupuncture.The similarity of dry needling and acupuncture treatment is the use of needles in both methods. The difference is that in acupuncture, the needles are inserted into certain points defined as meridians and waited for 20 minutes, whereas in dry needling treatment, the needle is applied to trigger points, tight bands, muscles with spasm or possibly spasm. Furthermore it is usually removed immediately, a long wait is also used in dry needling in some tense tissues[12,13]. Dry needling shows its effect immediately. In dry needling, the needle is inserted into various tissue depths according to the neuroanatomical structure. Even though various clinical effects have been attributed to dry needling in studies, conclusive evidence about its potential physiological effects and mechanisms of action is still lacking. While the dry needling creates a minimal inflammation in the area where it is applied, it provides an increase in microcirculation, desensitization in the nervous system and a significant decrease in pain following the application. In the inhibition of pain, it is aimed to increase the stimulation in the damaged tissue with dry needling and to provide afferent regulation in the brain[14, 15].

Dry needling in migraine and tension-type headaches

Migraine is a primary episodic headache disorder accompanied by neurological, gastrointestinal and autonomic changes. Kamali F et al., in a study published in 2019 and conducted on 44 patients, evaluated the effectiveness of dry needling treatment in patients with tension-type headache.

Pain and algometric measurement parameters improved in both groups. No superiority of treatments was found over each other[16].In a study conducted in 2020, Rezaeian T et al evaluated the effectiveness of dry needling treatment in 40 patients diagnosed with migraine and having an active trigger point in the sternocleidomastoid muscle. The patients were divided into two groups as dry needling and control groups. In the dry needling group, improvement was observed in all parameters immediately after the treatment and at the 1st month follow-up. It is recommended to keep this approach in mind in patients with migraine[17]. In conclusion, when the effectiveness of dry needling in migraine and tension headache is examined, dry needling method is effective, but more studies are needed.

Osteoarthritis and dry needling

Osteoarthritis is a degenerative disease characterized by progressive cartilage destruction, osteophyte formation, subchondral sclerosis, synovial membrane and a series of biochemical and morphological changes in the joint capsule, especially in load-bearing joints, with the effect of genetic, mechanical and biochemical factors. Sánchez Romero EA et al. In an article they conducted with 62 patients with knee osteoarthritis, they investigated the effectiveness of dry needling treatment. Exercise + dry needling was applied to one group, and sham-dry needling + exercise was applied to the other group. The superiority of dry needling treatment in pain and disability parameters has not been demonstrated[18]. Sánchez-Romero EA et al., in another article they published in 2018, investigated the effect of dry needling in knee osteoarthritis. This double-blind, parallel-group study included patients over 65 years of age with knee osteoarthritis with trigger points in the thigh muscles. The patients were divided into two groups as dry needling + exercise and sham-dry needling + exercise. Although pain and disability improved in both groups after 3 months, 6 sessions of dry needling did not contribute to exercise therapy[19]. Dunning J et al., in a study they published in 2018, investigated the effect of adding electrical stimulation dry needling treatment to manual therapy and exercise program in knee osteoarthritis with a study that included a total of 242 patients. In the group that received electrical stimulation dry needling, greater improvement in WOMAC disability scores was observed at 6 weeks and 3 months[20]. As a result, when the effectiveness of dry needling in knee pain caused by osteoarthritis is examined, the dry needling method is effective, but more studies are needed.

Dry needling and low back pain

Low back pain refers to pain, muscle tension, or difficulty in movement in the area below the arcus costarum and above the inferior gluteal folds. Most of the studies on low back pain in the literature investigated the effectiveness of dry needling in patients with nonspecific chronic low back pain. Loizidis T et al., in their article published in 2020, investigated the effect of dry needling treatment on pain and functional balance in patients with low back pain. At the end of the study, it was emphasized that dry needling provides statistically significant improvement in pain and balance, but more studies are needed on its effects on specific muscles[21]. Griswold D et al., in a study published in 2019, investigated the effects of manipulation techniques that do not include sudden maneuvers and segmental distal dry needling technique on pain, functionality, and recovery speed in patients with nonspecific low back pain. The patients were divided into two groups as dry needling and manipulation groups. Significant improvements were observed in both treatment groups, except for the pressure pain threshold. The superiority of the treatments over each other has not been demonstrated[22]. Tüzün EH et al., in their article published in 2017, compared the efficacy of physical therapy program and dry needling in patients with chronic low back pain. As a result of the study, it was observed that dry needling treatment reduced the number of pain and trigger points and reduced kinesiophobia in patients with chronic low back pain caused by lumbar disc herniation[23]. Liu L et al investigated the effectiveness of dry needling treatment in low back pain associated with trigger points in a systematic review and meta-analysis published in 2017. As a result of the meta-analysis, it was concluded that dry needling treatment is superior to other treatments in pain and functionality, but that the combination of dry needling treatment with other treatments is superior to dry needling treatment alone[24]. Koppenhaver SL et al., in their article published in 2015, investigated the factors affecting recovery in patients with low back pain who received dry needling treatment. At the end of the study, it was observed that the success of dry needling was high in low back pain that increased with the multifidus lift test or hip flexion in the supine position, and the success of dry needling decreased in cases of increased pain while standing,

pain radiating to the leg, and spinal hypermobility[25]. Koppenhaver SL et al., in an article published in 2015, compared the multifidus function and nociceptive sensitivity of patients with low back pain who received dry needling therapy and patients who responded to and did not respond to treatment. At the end of the study, there were significant improvements in muscle function and nociceptive sensitivity of patients who showed clinical improvement, compared to patients who did not show improvement, at measurements after 1 week[26]. As a result, when the effectiveness of dry needling in low back pain is examined, the dry needling method is effective, but more studies are needed.

Dry needling and temporomandibular pain

Tempomandibular pain is a clinical picture characterized by noise (crepitation or click) and irregular jaw movements in the jaw joint, and it is one of the most difficult conditions to treat among the causes of maxillofacial pain. Kütük SG et al., in their article published in 2019, evaluated the effectiveness of dry needling therapy in the treatment of temporomandibular pain. In their study on 40 patients, they applied one session of dry needling treatment to one group and one session of botulinum toxin injection to the other group in the lateral pterygoid muscle. In their studies in which they evaluated parameters such as resting pain, jaw protrusion angle, and mouth opening, significant improvement was found in both groups at the 6th week of treatment[27]. It was determined that the improvement in resting pain and jaw protrusion angle was statistically superior in the dry needling group. Lopez-Martos R et al., in their article published in 2018, presented the effectiveness of dry needling treatment in patients with myofascial pain in the temporomandibular region in a placebo-controlled study. In the study, which included 60 patients, the patients were divided into 3 groups and the lateral pterygoid muscle was treated. One group received 3 sessions of percutaneous electrolysis, the other group received dry needling treatment, and the third group received sham-dry needling treatment. In the study, the parameters of resting pain, pain during chewing and maximum mouth opening were evaluated, and significant improvements were found in these parameters in the dry needling and percutaneous electrolysis groups[28]. As a result, when the effectiveness of dry needling in temporomandibular pain is examined, the dry needling method is effective, but more studies are needed.

Dry needling and fibromyalgia

Fibromyalgia is a chronic pain syndrome characterized by widespread skeletal muscle pain and many tender points. In their article published in 2017, Castro-Sanchez AM et al evaluated the effects of dry needling treatment on thoracic and lumbar mobility and trigger points in patients with fibromyalgia syndrome. They included 64 patients in the study where they applied dry needling to one group and cross-tape to the other group. A total of 4 sessions of dry needling were applied to the latissimus dorsi, iliocostalis, multifidus, quadratus lumborum muscles once a week. In their study, in which they evaluated the algometric pain threshold and spinal mobility parameters before the treatment and in the first month of the treatment, they found that both treatment approaches had similar positive effects on spinal mobility. They also showed that dry needling treatment decreased the algometric pressure pain threshold[29]. In their article published in 2019, Castro-Sanchez AM et al evaluated the effects of dry needling and myofascial release treatments on trigger points in the cervical region on many parameters in patients diagnosed with fibromyalgia. In their randomized controlled study in which 64 patients were included, they applied dry needling treatment to the occipito-frontalis, splenius capitis, sternocleidomastoid, scalene, trapezius, supraspinatus, infraspinatus and multifidus muscles once a week for a total of 4 sessions. They found that both treatment approaches had similar positive effects on pain intensity and fibromyalgia impact questionnaire scores in their study, in which the parameters were evaluated before treatment and at the first month of treatment. In addition, it has been found that the effects of dry needling treatment on quality of life, sleep quality, anxiety and depression are superior[30]. As a result, when the effectiveness of dry needling in fibromyalgia is examined, the dry needling method is effective, but more studies are needed.

Dry needling and neck pain

Neck pain is defined as pain that occurs in the cervical, occipital or posterior scapular region without an underlying neurological problem, tumor, or a specific pathology such as inflammation. Studies on neck pain in the literature mostly investigated the effectiveness of dry needling in nonspecific chronic neck pain. If we take a look at these articles; In an article published in 2020, Arias-Buría et al investigated the treatment of active trigger points in the scalene muscles with dry needling in patients with mechanical neck pain.

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Pain and functionality parameters were evaluated after treatment, one week and one month later. While there was no difference between the groups after the treatment and at the first week of the treatment, it was observed that the dry needling treatment was superior in reducing the pain at the first month of the treatment. In addition, dry needling therapy was found to provide a greater increase in inspiratory vital capacity in all control periods compared to local pressure therapy[31]. Cerezo-Téllez E et al., in an article they published in 2016, investigated the effectiveness of dry needling in their study on office workers with neck pain. Stretching exercise was given to one group and dry needling and stretching exercises were given to the other group, and they were followed for 6 months. Better results were found in the dry needling group in all parameters of the patients followed for pain, range of motion, muscle strength and functionality[32]. Manafnezhad J et al., in their article published in 2019, compared the effects of dry needling treatment and ESWT treatment on active trigger points in the trapezius muscle in patients with nonspecific neck pain. At the end of the study, improvements were found in both the dry needling group and the ESWT treatment group[33]. Martín-Rodríguez A et al., in their article published in 2019, investigated the effects of dry needling treatment applied to the sternocleidomastoid muscle on motor control in patients with neck pain. At the end of the study, no significant difference was found between needling inside the trigger point and needling outside the trigger point, and it was seen that both treatment groups reduced pain and had a positive effect on cervical muscle control[34]. Ziaeifar M et al., in their article published in 2019, compared the effectiveness of dry needling therapy to trigger points in the upper fibers of the trapezius muscle and pressure therapy applied to trigger points. At the end of the study, significant changes in DASH scores and pain intensity were detected both after treatment, after 2 weeks, and after 3 months. There was no significant difference between the groups in the measurements after 2 weeks and 3 months[35]. Cerezo-Téllez E et al., in their article published in 2018, investigated the improvement in health-related quality of life in patients with chronic nonspecific neck pain in their secondary analysis from a single-blind randomized study. after treatment; It was evaluated at 1, 3 and 6 months. Improvements in both groups continued at all assessment times. In the 6th month evaluation, which is the last evaluation, it was seen that the treatment group showed a statistically significant improvement compared to the control group[36]. In their article published in 2020, Stieven FF et al investigated the effects of dry needling treatment added to the treatment protocols in patients with chronic neck pain. In the dry needling group, the decrease in pain intensity was observed in the measurements after 24 hours and in the measurements after 1 month; The authors concluded that dry needling therapy combined with protocol-defined rehabilitation programs did not provide additional benefit for patients with chronic neck pain[37]. As a result, when the effectiveness of dry needling in neck pain is examined, the dry needling method is effective, but more studies are needed.

Dry needling and primary dysmenorrhea

Dysmenorrhea, defined as uterine menstrual contractions, is the most common gynecological problem in women of reproductive age. Before or during the menstrual period, some women experience pain problems due to uterine contractions. Gaubeca-Gilarranz A et al., in their article published in 2018, evaluated the effectiveness of dry needling treatment in patients with primary dysmenorrhea. In this study, one group received a single session of dry needling and stretching exercises for the rectus abdominis muscle, the other group received a single session of sham-dry needling and stretching exercises for the rectus abdominis muscle, and the third group received isolated stretching exercises. The patients were evaluated in the 1st and 2nd months of the treatment. Follow-up was done with parameters such as pain level, number of days with pain, number of pain medication use, quality of life, and significant improvements were found in the pain intensity and amount of medication use in the dry needling group compared to the other groups[38]. In conclusion, when the effectiveness of dry needling in patients with primary dysmenorrhea is examined, the dry needling method is effective, but more studies are needed.

CLINICAL CONCLUSION

When the studies in the literature are examined, there are conflicting results, even if the studies on the dry needling method are limited. One of the reasons for these contradictions is that they may be related to chronic pain management because there is no direct relationship between pain and nociception. Pain is a reflection of our learned and past behavior

at the cortical level and is definitely the product of the brain. If no nociceptive stimulus can be found to explain the problem to people experiencing chronic pain, the problem should not be dismissed as psychological. Because pain is not always associated with a nociceptive stimulus (injury), many cognitive factors, stress obesity is also effective in the chronic pain process. The aim of the treatments in patients with chronic pain is to sensitize the hypersensitive system, including many techniques, complementary medicine applications, medical agents, etc. available. Dry needling method is also used as a reliable and minimally invasive method among these techniques. When chronic pain patients are examined, chronic pain turns into a situation that affects the whole body over time.

While dry needling therapy used by clinicians can be accepted in tactile and visual input, not only these but also proprioceptive input, vestibular input, nociceptive input from the patient, and knowledge and beliefs, past experiences, and predictions from patients are also necessary for pain modulation. It should not be forgotten that patients are affected by many factors in the treatment process of patients with pain. Therefore, the use of dry needling, which is a complementary medicine application in chronic pain management, together with other treatment modalities may produce more effective results. The current literature is compatible with this idea and recommends a multidisciplinary approach[39]. As a result, dry needling was found to be effective in most of the chronic painful disease groups. While patients perceptions of dry needling include higher expectations, the literature is limited in this subject.

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