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ORIGINAL RESEARCH

Knowledge, Attitudes and Opinions of Physicians on Cups Treatment

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Abstract
Objective: The aim of this study is to determine the knowledge, attitudes and thoughts of physicians about complementary medicine and cupping therapy in particular.
Material-Method: Between October 1, 2018 and December 10, 2018, a questionnaire consisting of 27 questions was applied face-to-face to 435 physicians working in various health institutions in Ankara and who agreed to participate in the survey voluntarily. Chi-square analysis and logistic regression analysis methods were used in the evaluation of the data. The significance level was taken as 0.05 in the interpretation of the results.
Results: The person's liking to practice medicine, having sufficient knowledge about traditional medicine, receiving training on traditional medicine, practicing traditional medicine, having him and his relatives practice traditional medicine, having positive and negative knowledge and experience about cupping, are effective in welcoming cupping practice positively ($p<0.05$).
Conclusion: In line with the findings of our study, most of the physicians think that they have insufficient knowledge about traditional and complementary medicine practices. In order to fill this gap, it can be considered to focus on pre-graduate and post-graduate education programs. By increasing the theoretical and practical applications related to traditional and complementary medicine methods, physicians can be placed at the center of these applications. As the use of traditional and complementary medicine treatment methods becomes more common in society, healthcare professionals have a great responsibility to inform the patients and to administer the treatments correctly.
Keywords: Cupping Therapy, Traditional Medicine, Complementary Therapies, Alternative Medicine

INTRODUCTION

According to the World Health Organization (WHO), traditional medicine is defined as the whole of knowledge, skills and practices that can be explained or not based on theories, beliefs and experiences specific to different cultures, which are used to protect, diagnose, improve or treat physical and mental diseases as well as to maintain health.[1]

Practices related to traditional and complementary medicine are increasing in our country as well as in the world. The methods defined by the regulation in our country; hypnosis, apitherapy, reflexology, phytotherapy, leech, homeopathy, chiropractic, cupping, larvae application, mesotherapy, prolotherapy, osteopathy, ozone application and music therapy.[2,3]

Cupping therapy, one of these methods, is a universal treatment method that has been used in the East and West for centuries. It was first used in history by the Assyrians. It was applied with tools such as animal horns and bamboo in the 3500s.[4,5]

Cupping therapy has spread to many European and US countries through Egypt. In England, the practice of the Cup dates back hundreds of years. "The Lancet," one of the leading medical journals, is named after the practice of cupping therapy.[6]

Although the mechanism of action of cupping therapy is not fully understood today, there are various hypotheses and scientific studies related to it. It is argued that cupping therapy has positive neural, metabolic, immunological, hematological and psychiatric effects. It is stated that cupping therapy is a good deep tissue massage method.[7,8,9]

As with other traditional methods of medicine, the application of cupping therapy by competent and authorized people is extremely important for patient health. The application of cupping therapy by unauthorized persons does more harm than good to the patient and undermines the confidence in this

treatment method.[7] Therefore, in order to prevent illegal and uninformed practices, the authority to apply any of the traditional and complementary medicine methods has been given by the Ministry of Health of the Republic of Turkey to only physicians and dentists only, limited to their own fields, with the regulation published in the Official Gazette No. 29158 on October 27, 201410.[10]

Although only certified physicians and dentists are authorized to apply cupping therapy by the Ministry of Health, there are still many non-physicians who still practice this treatment. Cupping treatment practice by incompetent people is a threat to public health, but it casts a shadow over the effectiveness and reliability of this treatment method.[7] For this reason, physicians should be involved in this platform both in practice and education in order for cupping therapy to become widespread in the society on scientific and ethical grounds. For this purpose, the knowledge and opinions of physicians who are practitioners of complementary medicine are important for the applicability of traditional medical practices.

The aim of this study is to reveal the knowledge, attitudes and thoughts of physicians who are practitioners of traditional medicine methods about cupping therapy.

MATERIALS AND METHODS

In this study, a questionnaire with 27 questions was used to determine the knowledge, attitudes and thoughts of traditional medicine practitioners about cupping therapy. The study was conducted with the approval of the Ethics Committee of Health Practice and Research Center of Health Sciences University, Keçiören, dated 26.09.2018 and numbered 1762. Between October 1, 2018 and December 10, 2018, a face-to-face questionnaire was applied to physicians working in various health institutions under the roof of Health Sciences University in Ankara, with their written consent (based on volunteerism). In addition to the questions that included information such as place of work, medical status, branch, age, gender, and the year spent in the profession, the questionnaire was applied to the physicians, whether they like to practice medicine, whether they have sufficient knowledge about traditional medicine, the source of information about traditional medicine, any branch of traditional medicine. whether he has education and if so, which branch he has studied, whether he has practiced any branch of traditional medicine, whether his relatives have had traditional medicine practice, whether he has welcomed the cup application, the reasons for your positive and negative opinion, whether there are situations that will change the negative opinion, Questions were asked about whether he had positive or negative information about the cup application, whether he had a positive or negative experience with the cup application, and whether he wanted to take part in a scientific study about the cup application. Data were collected from a total of 435 physicians who voluntarily agreed to participate in the study. The limitation of the study is that it was conducted only in various centers in the province of Ankara.

Evaluation of the data was done using SPSS 22.0. Descriptive) statistics (percentage for categorical data, mean and standard deviation for numerical data of all variables are presented. The effect of other variables on the positive response of cupping therapy was examined by binary logistic regression analysis. Chi-square analysis was applied for the relationship between categorical variables. The significance level was taken as 0.05 in the interpretation of the results.

RESULTS

Of the 435 physicians who participated in the study, 23.4% were specialists, 65.7% were assistants and 10.8% were general practitioners. According to their field of study, 87.4% work in hospitals, 8% in FHCs and 4.6% in other health care institutions. The distribution according to their speciality is; Family Medicine 38.3%, Internal Medicine 13.1%, General Practice 10.6%, Pediatrics 8.9%, Emergency 3.9%, Anesthesia and Resusciation 3.2%, Other 19%. The mean age of the participants was 30.2 ± 5.25 years, and the mean length of professional experience was 5.64 ± 5.17 years (Table 1). When we examine the answers given by the physicians to the questions about traditional medicine (Table 2); while 22.5% of the participants thought that they had sufficient knowledge about traditional medicine, 77.5% of them stated that they did not have enough information. It was stated that 47.8% of the information about traditional medicine was obtained from the media. The rate of those who received any training on traditional medicine is 10%. Acupuncture, aromatherapy, bioresonance, phytotherapy, hypnotherapy, cupping, hirudotherapy, mesotherapy, prolotherapy, manual therapy, ozone, leech are their training areas. It was observed that the most training was received in the application of cups. 8% of the physicians stated that they practice a branch of traditional medicine. The rate of those who practice traditional medicine is 20%, and the rate of those who have their relatives practice traditional medicine is 29%.

Table 1. Distribution of physicians participating in the survey according to certain characteristics

Survey Question	Categories	(n)	(%)
Physician status	Specialist	102	23.40
	Assistant	286	65.70
	General practitioner	47	10.80
Field of study	Hospital	380	87.40
	Family health center	35	8.00
	Other health institutions	20	4.60
Branches	Family medicine	167	38.30
	Internal medicine	57	13.10
	General practitioner	46	10.60
	Pediatrics	39	8.90
	Emergency	17	3.90
	Anesthesia and reamination	14	3.20
	Public health	12	2.80
	Other	83	19.00
Gender	Female	262	60.20
	Male	173	39.80
Do you like to practice medicine?	Yes	346	79.54
	No	89	20.46

Table 2. Descriptive statistics of the questions asked about cupping therapy

Survey Question	Categories	(n)	(%)
Do you have enough knowledge about traditional medicine?	No	337	77.50
	Yes	98	22.50
What is your source of information about traditional medicine?	Media (TV, internet, magazine etc.)	296	47.82
	Scientific resources (education, publication, etc.)	189	30.53
	Other	134	21.65
Do you have training in any branch of Traditional Medicine?	Yes	42	9.66
	No	393	90.34
Do you practice any branch of traditional medicine?	No	401	92.20
	Yes	34	7.80
Have you made yourself a traditional medicine practice?	Yes	85	19.54
	No	350	80.46
Have your relatives had traditional medicine practice?	Yes	125	28.74
	No	310	71.26
Do you welcome the Cup application?	Yes	235	54.00
	No	200	46.00
What are the reasons for your positive opinion?	Experience	128	30.55
	Scientific resource (education, publication, etc.)	93	22.20
	Religious reasons	88	21.00
	Media (TV, magazine, internet, etc.)	57	13.60
	Other	53	12.65
What are the reasons for your negative opinion?	Scientific resource (education, publication, etc.)	96	37.65
	Media (TV, magazine, internet, etc.)	38	14.90
	Experience	31	12.16
	Other	90	35.29
Are there situations that will change your negative opinion?	No	111	63.87
	Yes	86	36.13
Did you get any negative information about the cup application?	Yes	146	33.56
	No	289	66.44
Did you get positive information about the cup application?	Yes	234	53.79
	No	201	46.21
Have you had a negative experience with the Cup app?	Yes	34	7.82
	No	401	92.18
Have you had a positive experience with the Cup app?	Yes	115	26.44
	No	320	73.56
Have you heard of negative scientific study about the cup application?	Yes	48	11.03
	No	387	88.97
Have you heard of the positive scientific study about the cup application?	Yes	104	23.91
	No	331	76.09
Would you like to take part in a scientific study about the cup application?	Yes	187	42.99
	No	248	57.01

If we examine the opinions of the physicians on cupping, which is a method of traditional medicine, while the rate of those who welcomed the use of cups was 54%, it was seen that the rate of those who viewed it negatively was 46%. While 31% of the physicians who view cupping therapy positively express a positive opinion based on experience, 38% of those who have a negative opinion about the application view cupping therapy negatively in line with the information they have obtained from scientific sources. The rate of those who have a positive opinion of this practice for religious reasons is 21%. 63% of those who have a negative opinion about cupping stated that there is no situation that would change their current opinion. The rate of those who had previously received negative information about the cup application was 34%, and the rate of those who had received positive information was 54%. The rate of those who have had a negative experience with the cup application is 8%, and the rate of those who have had a positive experience is 26%. While the rate of physicians encountering positive scientific studies on cupping therapy is 24%, the rate of physicians encountering negative scientific studies is 11%. It has been observed that the rate of those who want to take part in a scientific study on cupping therapy is 43%.

According to the results of the chi-squared analysis shown in Table 3, the relationship between the status of the physician, the place where the physician works, and gender was not found to be significant ($p>0.05$). The fact that the person likes to practice medicine, thinks that he has sufficient knowledge about traditional medicine, receives training in traditional medicine, practices traditional medicine, has himself and his relatives practice traditional medicine, and has positive and negative knowledge and experience about cupping is effective in the positive acceptance of cupping practice ($p<0,05$). While 56.4% of those who like to practice medicine positively agree with the application of cups, 55.1% of those who do not like medicine are negative about the application of cups. While 56.4% of those who like to practice medicine have a positive attitude towards cupping, 55.1% of those who do not like medicine have a negative attitude towards cupping. While 66.3% of those with sufficient knowledge of traditional medicine responded positively to the practice, 50% of those without sufficient knowledge reported positive and 50% negative opinions. It was observed that 86% of those who had received training in traditional medicine and 50% of those who had not had a positive attitude towards the practice. 97% of those who practice traditional medicine and 85% of those who have used traditional medicine on themselves and their relatives have a positive view of cupping therapy. While 66% of those who have negative information about cupping have a negative view of its use, 82% of those who have positive information about it welcome its use. While 79.4% of those who had a negative experience with cupping have a negative opinion of the practice, 96.5% of those who had a positive experience with cupping have a positive opinion of the practice. While 69% of those who had heard negative scientific studies about cupping had a negative view of the practice, 81% of those who had heard positive scientific studies welcomed the practice. While 82% of those who wanted to participate in a scientific study about cupping welcomed the practice, 67% of those who did not want to participate in a scientific study welcomed the practice negatively.

Results of logistic regression analysis

In the logistic regression analysis, the variable of "welcoming the cup application positively" was the dependent variable, liking medicine, having knowledge about traditional medicine, having education about traditional medicine, practicing traditional medicine, having traditional medicine applied to himself and his relatives, positive about the cup. Negative knowledge and experience, hearing positive-negative scientific studies about the cup, participating in a scientific study about the cup were taken as independent variables (Table 4). According to the Hosmer-Lemeshow goodness of fit test, the logistic regression model was found to be appropriate. The variables found significant in the model are "positive-negative knowledge and experience about cupping therapy" and "willingness to participate in a scientific study about cupping". From the corresponding parameter (-2.3) in the model, it can be understood that having negative information about cupping therapy has a negative effect on positive acceptance of cupping therapy. Having positive information about cupping increases the positive acceptance of cupping by 17.74 times ($p<0.05$). Negative experience with cupping had a negative effect on positive acceptance of cupping (-3.06). A positive experience with cupping increased the positive response to cupping by 43.9 times ($p<0.05$). Hearing negative scientific studies about cupping therapy had a negative effect on the positive reception of cupping therapy (-1.53). The desire to conduct scientific research on cupping treatment increased the positive response rate of cupping by 3.6 times ($p<0.05$).

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Table 3. Chi-square analysis results

Questions	Categories		Cup Positive Reception		p value
			Yes	No	
Physician status	Specialist	N	47	55	0.165
		%	46.1%	53.9%	
	Assistant	N	160	126	
		%	55.9%	44.1%	
	General practitioner	N	28	19	
		%	59.6%	40.4%	
Field of study	Hospital	N	206	174	0.947
		%	54.2%	45.8%	
	Family health center	N	18	17	
		%	51.4%	48.6%	
	Other health institutions	N	11	9	
		%	55.0%	45.0%	
Gender	Female	N	145	117	0.28
		%	55.3%	44.7%	
	Male	N	90	83	
		%	52.0%	48.0%	
Do you like to practice medicine?	Yes	N	195	151	0.035
		%	56.4%	43.6%	
	No	N	40	49	
		%	44.9%	55.1%	
Do you have enough knowledge about traditional medicine?	Yes	N	65	33	0.004
		%	66.3%	33.7%	
	No	N	170	167	
		%	50.4%	49.6%	
Do you have training in any branch of Traditional Medicine?	Yes	N	36	6	<0.001
		%	85.7%	14.3%	
	No	N	199	194	
		%	50.6%	49.4%	
Do you practice any branch of traditional medicine?	Yes	N	33	1	<0.001
		%	97.1%	2.9%	
	No	N	202	199	
		%	50.4%	49.6%	
Have you made yourself a traditional medicine practice?	Yes	N	72	13	<0.001
		%	84.7%	15.3%	
	No	N	163	187	
		%	46.6%	53.4%	
Have your relatives had traditional medicine practice?	Yes	N	106	19	<0.001
		%	84.8%	15.2%	
	No	N	129	181	
		%	41.6%	58.4%	
Did you get any negative information about the cup application?	Yes	N	49	97	<0.001
		%	33.6%	66.4%	
	No	N	186	103	
		%	64.4%	35.6%	
Did you get positive information about the cup application?	Yes	N	191	43	<0.001
		%	81.6%	18.4%	
	No	N	44	157	
		%	21.9%	78.1%	
Have you had a negative experience with the Cup app?	Yes	N	7	27	<0.001
		%	20.6%	79.4%	
	No	N	228	173	
		%	56.9%	43.1%	
Have you had a positive experience with the Cup app?	Yes	N	111	4	<0.001
		%	96.5%	3.5%	
	No	N	124	196	
		%	38.8%	61.3%	
Have you heard of negative scientific study about the cup application?	Yes	N	15	33	0,001
		%	31.3%	68.8%	
	No	N	220	167	
		%	56.8%	43.2%	
Have you heard of the positive scientific study about the cup application?	Yes	N	84	20	<0.001
		%	80.8%	19.2%	
	No	N	151	180	
		%	45.6%	54.4%	
Would you like to take part in a scientific study about the cup application?	Yes	N	153	34	<0.001
		%	81.8%	18.2%	
	No	N	82	166	
		%	33.1%	66.9%	

Table 4. Logistic regression analysis result

Independent variables	B	S.E.	Wald	df	p value	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Do you like to practice medicine? (1)	0.147	0.38	0.151	1	0.697	1.158	0.552	2.429
Do you have enough knowledge about traditional medicine? (1)	0.027	0.44	0.004	1	0.95	1.028	0.436	2.424
Do you have training in any branch of Traditional Medicine? (1)	1.342	0.97	1.902	1	0.168	3.826	0.568	25.755
Do you practice any branch of traditional medicine? (1)	-2.19	1.48	2.206	1	0.138	0.112	0.006	2.016
Have you made yourself a traditional medicine practice? (1)	0.662	0.7	0.903	1	0.342	1.939	0.495	7.603
Have your relatives had traditional medicine practice? (1)	0.78	0.47	2.739	1	0.098	2.181	0.866	5.49
Did you get any negative information about the cup application? (1)	-2.3	0.43	28.19	1	<0.001	0.1	0.043	0.234
Did you get positive information about the cup application? (1)	2.876	0.4	52.15	1	<0.001	17.737	8.127	38.711
Have you had a negative experience with the Cup app? (1)	-3.06	0.95	10.31	1	0.001	0.047	0.007	0.304
Have you had a positive experience with the Cup app? (1)	3.783	0.88	18.44	1	<0.001	43.931	7.816	246.9
Have you heard of negative scientific study about the cup application? (1)	-1.53	0.8	3.706	1	0.054	0.216	0.046	1.028
Have you heard of the positive scientific study about the cup application? (1)	1.089	0.61	3.19	1	0.074	2.972	0.899	9.822
Would you like to take part in a scientific study about the cup application? (1)	1.287	0.34	14.12	1	<0.001	3.623	1.851	7.088
Constant	-1.7	0.38	20.28	1	<0.001	0.184		

DISCUSSION

Practices related to traditional and complementary medicine are increasing in our country as well as in the world. There are different thoughts and opinions about these practices among physicians who are authorized to perform traditional and complementary medicine practices. Some of the physicians apply and recommend traditional and complementary medicine practices to their patients. Some physicians, on the other hand, find these treatment methods unreliable and oppose them for various reasons. As in our country, there are different opinions among physicians regarding traditional and complementary medicine practices in the world. With this study, we aimed to determine the knowledge, attitudes and thoughts of physicians about cupping therapy and to reveal the reasons underlying their different opinions. In a study by Özçakır et al. on general practitioners, 51% of the physicians stated that they believed that complementary and traditional medicine was beneficial.[11] While 54% of the physicians participating in our study welcomed cupping therapy, 46% stated that they viewed cupping therapy negatively, and it is seen that almost similar rates were obtained with the literature.

The relationships between the variables of having positive knowledge about cupping therapy and receiving education about traditional medicine and the variable of positive acceptance of cupping were found to be statistically significant ($p<0,05$). In a study conducted by Mahapatra et al. in the USA in

2017, it was reported that after the complementary medicine education given to medical school students, there was an increase in complementary medicine practices and positive attitudes towards it, which supports the results of our study.[12] In another study published in Israel in 2018, 22 nurses were given complementary medicine training, and their thoughts on complementary medicine were compared before and after these trainings. After the training, it was determined that the positive thoughts of the nurses about complementary medicine increased. At the same time, the nurses stated that the success of the treatment increased by using more complementary medicine methods more in the treatment of patients.[13] Sönmez et al., in their study conducted in Düzce in 2018, found a positive and significant relationship between the status of students having traditional and complementary medicine practices and their knowledge about these practices.[14]

Jump et al., in their study on 138 physicians in the USA, stated that 34.8% of physicians who had personally experienced one of the complementary medicine practices considered complementary medicine as a legitimate treatment method.[15] Similarly, Zhang et al. examined the attitudes and behaviors of primary health care providers in the USA and found that positive results reinforced positive opinions about the effectiveness of complementary medicine practices among patients, their families, friends, and colleagues.[16] In a study published in 2014 by Wahner-Roedler et al., it was reported that the most important factors affecting physicians' attitudes about complementary medicine were personal experience and recommendations of respected colleagues who used therapy on their own.[17] In our study, the relationship between having a positive experience with cupping and welcoming cupping was found to be statistically significant ($p<0.05$), and it was concluded that having a positive experience increased the rate of positive cupping by 43.9 times.

Zhang et al. determined that scientific resources are effective on thoughts about complementary medicine.[16] Wahner-Roedler et al. found that scientific studies have an effect on physicians' views on complementary medicine.[17] In our evaluation, a statistically significant relationship was found between hearing positive scientific studies about cupping treatment and positive acceptance of cupping ($p<0.05$). It was concluded that hearing positive scientific studies increased the rate of positive response to sand application by 2.9 times.

Göker et al. conducted a study between 2012 and 2013 on the knowledge of dermatologists in Turkey regarding alternative and complementary medicine methods. The study found that 67.5% of physicians had little to no knowledge, while 13% had no knowledge at all. In another study by Özçakır et al., 60.8% of participants reported insufficient knowledge about traditional and complementary medicine.[18] In the study conducted by Özçakır et al., 60.8% of the participants stated that their knowledge level about traditional and complementary medicine was insufficient.[11] In the study of Ziodeen et al. on pediatric residents in the USA, it was reported that the biggest obstacle for physicians to recommend traditional and complementary medicine methods to their patients is their limited knowledge of the subject.[19] 22.5% of the physicians participating in our study stated that they had sufficient knowledge about traditional medicine, and 77.5% stated that the level of knowledge was insufficient. This rate reveals that the level of knowledge of doctors about traditional and alternative medicine is insufficient. The absence of any training on traditional and alternative medicine, both before and after graduation, may explain the low level of knowledge.

43% of the physicians in our study expressed interest in participating in a scientific study on cupping therapy. In a study conducted in the surgical service in Sweden, 27.8% of the participants expressed interest in participating in complementary and alternative medicine projects, and 61.2% believed that more research funds should be allocated for complementary and alternative medicine research.[20]

In our study, 84.8% of participating physicians whose relatives received cupping therapy reported a positive attitude towards it. According to Oral et al., 73.2% of those who have used traditional and complementary medicine decided to have the practice done based on recommendations from relatives, friends, and neighbors.[21]

Additionally, 46% of the physicians in our study had a negative opinion about cupping therapy. The Turkish Medical Association (TBB) has expressed a negative opinion regarding traditional and complementary medicine methods due to the lack of scientific and reliable studies. According to a study by Ziodeen et al., 66.2% of physicians believe that there is insufficient evidence to support these practices.[19]

CONCLUSION

Physicians' lack of knowledge about traditional and complementary medicine and the finding that positive knowledge increases the positive response to

cupping therapy suggests that pre- and post-graduate training on traditional and complementary medicine should be emphasized. In order to fill this gap, it can be considered to focus on pre-graduate and post-graduate education programs. Plans can be made to add theoretical and practical applications related to traditional and complementary medicine methods to the education curriculum of medical faculties.

The fact that experience has a positive effect on welcoming cupping therapy indicates that clinical studies in which physicians are involved should be increased. The lack of scientific resources related to traditional and complementary medicine practices causes physicians to approach these methods with suspicion. It is thought that scientific resources should be increased by encouraging physicians to do research on this subject and supporting scientific studies to be carried out. The number of traditional and complementary medicine practice centers in health institutions should be increased and physicians should be placed at the center of these practices. At the same time, it is suggested that scientific studies should be carried out in the light of the data to be obtained from these centers.

Many participants cited the media as a reason for their positive or negative opinions. Physicians should be provided with more accurate information on this subject with the resources to be published in the media.

More than half of the physicians participating in our study reported that they did not want to take part in a scientific study on cupping therapy. They also cited the scientific source among the reasons for their positive and negative opinions about cupping therapy. By supporting the studies to be done in this field and encouraging physicians to participate in these studies, the number of scientific resources and the thought of physicians to participate in scientific studies can be increased.

Many physicians think that they have insufficient knowledge about traditional and complementary medicine practices. Considering that the use of traditional and complementary medicine treatment methods is becoming increasingly common in the society, healthcare professionals have a great duty and responsibility to inform patients and to administer treatments correctly.

Multicenter studies with more participants are needed to evaluate the status of traditional and complementary medicine practices in Turkey.

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ORIGINAL RESEARCH

Determination of Nurses' Attitudes Towards the Use of Traditional and Complementary Medicine in Children: A Comparative Study

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Abstract
Objective: This study aimed to evaluate nurses' attitudes towards the use of traditional and complementary medicine (T&CM) practices in pediatric care.
Material-Method: The study employed a cross-sectional comparative descriptive design and was conducted between May and August 2023. Participants were nurses employed at a secondary healthcare hospital in eastern Turkey. The study analyzed demographic data on nurses and their attitudes towards holistic complementary and alternative medicine.
Results: : The results showed that the average age of participants was 33.92 years, with 69% working in state hospitals. Additionally, 25.4% of nurses reported prior use of T&CM, with cupping or leeching being the most commonly used method, chosen by 38.5% of respondents. Among those who had previously used T&CM practices, 63.5% reported positive outcomes, and 84.6% indicated that they would recommend the methods they had used to others. Furthermore, 51% of the nurses believed that T&CM practices could be suitable for children, with homeopathy being the most frequently considered T&CM method for pediatric use, chosen by 50.7%.
Conclusion: The study indicates that pediatric nurses generally have a positive view of T&CM practices and consider them safe for pediatric treatment. It is important to note that nurses often obtain information about T&CM from sources such as newspapers, magazines, or media programs. Therefore, integrating T&CM into nursing education curricula could be an effective way to promote awareness and understanding of these practices.
Keywords: Attitude, Child, Nurse, Traditional and Complementary Medicine (T&CM), Treatment

INTRODUCTION

Traditional and complementary medicine (T&CM) or complementary and alternative medicine (CAM) are supportive therapies, including dietary supplements, homeopathic medicines, herbal mixtures, and homemade compounded products.[1] These products are generally used to support, or as an alternative method to, modern treatment practices for the prevention and treatment of disease.[2] The most commonly used T&CM interventions in the literature include herbal therapy, aromatherapy, massage, acupuncture, acupressure, reflexology, therapeutic touch, prayer, meditation, relaxation, exercise, and biofeedback.[3] In recent years, the use of T&CM in children has increased.[4] It has been reported that the annual prevalence of T&CM use among adults in the United States is 34-38%, and 20-28% in the United Kingdom.[5] A study conducted by Harris and Rees found that T&CM has a worldwide prevalence of 23-62%.[6] Studies of T&CM use in children have found that it varies from 11-51%, similar to adults.[7] There are a limited number of studies showing that the prevalence of T&CM use in pediatric patients in Turkey varies between 48.9-77.0%.[8] In children and adolescents, T&CM is commonly used for the treatment of back, neck, head or chest pain, colds, anxiety or stress, attention deficit hyperactivity disorder and sleep disorders.[9]

There are several reasons for the widespread use of T&CM practices in children. Because these interventions are non-invasive, they are easily accessible and generally use natural products. In addition, these inexpensive practices can reduce the side effects of treatments.[10] It has also been reported that T&CM may be preferred to relieve physical symptoms such as pain, support the immune system, support medical treatments, improve overall health, and help children relax.[11]

Health care professionals have begun to integrate these therapies more and more into their daily interventions. It has been reported that their knowledge and attitudes about T&CM may influence patients' beliefs and behaviors related to these

practices.[12] Although T&CM supporting traditional medical practices is widely used in high-, middle-, and low-income countries, it has been noted that no research has been conducted to evaluate the opinions and attitudes of health care professionals other than physicians.[13] However, nurses play an important role in the selection of the therapeutic approach.[14] In addition, nurses are one of the most important groups of health care providers. In addition, nurses are one of the largest groups of health professionals in regular contact with the public, and they can help patients make informed decisions about T&CM.[15] Therefore, nurses need to increase their knowledge and experience of T&CM.[16] This study aimed to fill the existing gap in the literature and determine the attitudes of nurses towards the use of T&CM practices in children.

Hypotheses:

H1: Nurses' chronic disease status is associated with attitudes towards T&CM.

H2: Nurses' previous use of T&CM is associated with attitudes towards T&CM.

H3: Nurses' educational level is associated with attitudes towards T&CM.

MATERIALS AND METHODS

Research design

This study was designed as a cross-sectional comparative descriptive study. The study was conducted between May and August 2023.

Population and sample

The study population consisted of nurses working in two different hospitals providing secondary health care services in a province located in eastern Turkey. The population was accessed without the use of any sampling method. This study involved the participation of 410 nurses. A power analysis was conducted using G-Power 3.1.9.4 software, which determined that the effect size of the study was 0.3 with 96% power and a 0.05 significance level.[17]

Inclusion criteria

The inclusion criteria consisted of volunteers who worked as nurses in the mentioned hospitals and who agreed to participate in the study verbally and in writing.

Exclusion criteria

The study excluded nursing students who were in the clinics and wards for compulsory internship practice, as well as individuals who declined to participate.

Data collection tools

The researchers collected data using face-to-face interviews and the following tools: a sociodemographic characteristics information form, an information form about T&CM interventions, and the Holistic Complementary and Alternative Medicine Questionnaire (HCAMQ).

Sociodemographic characteristics information form

The sociodemographic characteristics information form consisted of 22 questions that inquired about age, gender, level of education, level of income, and other relevant factors.

The holistic complementary and alternative medicine questionnaire

It was developed by Hayland et al. to assess individuals' attitudes towards T&CM, was used.[18] Turkish validity and reliability study was conducted by Erci.[19] The questionnaire, which has two subscales, consists of 11 items rated on a 6-point Likert-type scale. The questionnaire assesses attitudes towards complementary and alternative medicine (CAM) and holistic health. It consists of 11 items, with scores ranging from 11 to 66. A low score indicates a favorable attitude towards CAM. The original scale has a Cronbach α value of 0.72, while the scale in this study has a Cronbach α value of 0.89.

Pilot study

A pilot study was conducted to test the content, understandability, suitability for nurses, and time required to complete the questionnaire. The study results do not include the data collected from the pilot study, which involved 10 nurses testing the forms.

Application of data collection tools

Before deciding to participate in the research, volunteers received an explanation of the study's purpose and methodology. Data collection forms were introduced, and any unclear sections were clarified. It was emphasized that participation was entirely voluntary and that the information obtained from the forms would be used exclusively for study purposes. The questionnaires were completed in 10-15 minutes. To increase participation, hospitals were visited on both weekdays and weekends, and repeated visits were made to clinics in an attempt to involve all nurses in the study.

Statistical analysis

The research data was analyzed using the SPSS (Statistical Package for Social Sciences 25.0) program. Kurtosis and skewness values were examined to assess the multivariate normal distribution of the variables. For a multivariate normal distribution, it is desired that the skewness value falls within the range of -2 to +2, and the kurtosis value falls within the range of -10 to +10.[20] The analysis revealed that the skewness value ranged from 0.349 to 0.121, and the kurtosis value ranged from -0.951 to 0.240. Some variables met the criteria

for normal distribution, while others did not. Parametric tests were used for normally distributed data, and non-parametric tests were used for non-normally distributed data. Descriptive statistics and mean scores for HCAMQ data were calculated, and $p<0.05$ was set as the statistical significance level for all comparisons.

Ethical approval

Approval was obtained from the XXX University ethics committee on 11.04.2023, with the approval number E.104135. Approval was obtained from the hospitals where the data would be collected for the study on May 22, 2023 (reference number 108639). Participants were informed both verbally and in writing about the study's purpose and methods, and their consent was obtained. The study was conducted in accordance with the ethical standards outlined in the Declaration of Helsinki. Personal information of the participating nurses was kept confidential.

RESULTS

The study found that the mean age of participating nurses was 33.92±4.86. The majority of participants were female (74.6%), undergraduate graduates (73.7%), and had a good income level (76.8%). Additionally, 69% of participants worked in a state hospital, 25.9% worked in internal services, and 62.4% had 5.1-10 years of experience. In the study, it was found that 58.1% of the nurses rated their general health status as 'middle', while 11.5% reported having a chronic disease. Additionally, 65.1% of the nurses reported having a family member with a chronic disease.

Regarding the use of traditional and complementary medicine (T&CM), 25.4% of the nurses reported having used T&CM before. Cupping or leeching was the most commonly used T&CM method, with 38.5% of the nurses reporting its use. Of those who used T&CM, 63.5% reported recovery with the method they used, and 84.6% recommended the method to others. The study found that 26.3% of the nurses' belief in traditional and complementary medicine (T&CM) was mostly influenced by newspapers, magazines, or media programs. Additionally, 51% of the nurses believed that T&CM practices could be used in children. Of the participants, 53.1% agreed that T&C practices were effective. Homeopathy was identified as the most commonly used method for children, with a prevalence rate of 50.7% (Table 1).

Table 1. Comparison of the sociodemographic characteristics of the nurses with the mean total scores of the HCAMQ (n=410)

Variables	n	%	HCAMQ Mean±SD	HCAMQ Test value	p
Gender					
Male	104	25.4	22.03 ± 6.03	[a]t=0.466	0.641
Female	306	74.6	21.72 ± 5.41		
Level of education					
High school	30	7.3	24.56 ± 6.95		
Associate degree	73	17.8	22.81 ± 4.86	[b]KW=6.325	**0.037**
Undergraduate	302	73.7	20.93 ± 5.22		
Postgraduate	5	1.2	21.64 ± 5.90		
Level of income					
Bad	37	9.0	22.09 ± 6.03	[c]F=5.151	**0.006**
Middle	315	14.1	21.67 ± 5.34		
Good	58	76.8	18.83 ± 4.88		
Worked hospital					
State hospital	283	69.0	22.63 ± 6.03	[a]t=4.661	**0.000**
Gynecology and pediatrics hospital	127	31.0	19.76 ± 5.10		
Worked unit					
Emergency	36	8.8	21.94 ± 6.68		
Operating room	27	6.6	21.62 ± 6.12		
Intensive care	45	11.0	23.33 ± 5.32		
Internal service	106	25.9	22.83 ± 6.06	[c]F=3.270	**0.002**
Surgical service	96	23.4	21.92 ± 5.64		
Day unit or outpatient service units	48	11.7	20.64 ± 5.34		
Maternity or labor services	25	6.1	20.08 ± 5.54		
Child services	27	6.6	17.74 ± 5.53		
Experience (years)					
0-5 years	61	14.9	22.26 ± 5.84		
5.1-10 years	256	62.4	21.76 ± 5.99	[c]F=0.448	0.639
10.1 years and above	93	22.7	21.34 ± 5.72		
General health status					
Bad	37	9.0	19.67 ± 3.25	[c]F=6.975	**0.001**

Middle	238	58.1	22.78±5.36		
Good	135	32.9	23.39±6.06		
Chronic disease status					
Yes	47	11.5	20.10±5.45	[a]t=2.027	**0.043**
No	363	88.5	21.95±5.93		
Diagnosis of chronic disease (n=47)					
Asthma	10	21.3	19.33±3.51		
Goiter	4	8.5	21.01±6.20		
Hypertension	17	36.2	20.94±5.93	[b]KW=6.325	**0.029**
Lung cancer	3	6.4	18.53±3.17		
Diabetes	13	27.7	20.02±9.27		
Chronic disease in the family					
Yes	267	65.1	21.11±5.61	[a]t=2.950	**0.003**
No	143	34.9	22.90±6.26		
Previous use of T&CM/CAM					
Yes	104	25.4	20.08±5.97	[a]t=3.353	**0.001**
No	306	74.6	22.30±5.78		
T&CM/CAM practice (n=104)					
Acupuncture	20	19.2	20.17±5.45		
Aromatherapy	17	16.3	20.95±5.97	[b]KW=2.120	0.548
Apitherapy	27	26.0	19.85±6.55		
Cupping or leeching	40	38.5	18.92±5.53		
Curing status of the disease after the use of T&CM/CAM (n=104)					
Yes	66	63.5	18.75±5.25	[a]t=3.111	**0.002**
No	38	36.5	22.39±6.49		
Status of recommending T&CM/CAM to others (n=104)					
Yes	88	84.6	19.71±5.85		
No	7	6.7	22.71±6.23	[b]KW=2.547	**0.028**
Undecided	9	8.7	21.66±6.92		
Sources of information about T&CM/CAM					
Personal experiences	27	6.6	20.92±6.56		
Scientific research	11	2.7	25.45±5.24		
University education	66	16.1	21.01±5.46		
Cultural background	31	7.6	24.91±4.96	[b]KW=15.827	**0.015**
Newspapers. magazines, or media programmes	108	26.3	21.60±6.15		
Information from my environment	93	22.7	21.87±5.90		
Information from health professionals	74	18.0	20.87±5.69		
Usability of T&CM/CAM in children					
Yes	209	51.0	20.83±5.81	[a]t=3.101	**0.002**
No	201	49.0	22.62±5.88		
Which types of diseases should T&CM/CAM be used in children (n=209)					
Febrile disorders	68	32.5	19.67±5.33		
Oncological diseases	15	7.1	20.12±4.71		
Respiratory system diseases	96	45.9	18.22±4.78	[b]KW=13.775	**0.029**
Nutritional problems	11	5.2	21.15±3.49		
Gastrointestinal diseases	19	9.3	21.65±4.12		
Reasons for wanting to use T&CM/CAM in children (n=209)					
Belief in curing the disease	42	20.1	19.95±5.80		
Thinking that GETAT will support the effectiveness of other treatments	111	53.1	20.55±5.73	[b]KW=16.385	**0.001**
Wanting to do everything possible to cure the disease	32	15.3	20.62±4.95		
Advice from health professionals	24	11.5	19.95±5.11		
Which T&CM/CAM practices can be used in children (n=209)					
Homeopathy	106	50.7	17.77±4.32		
Phytotherapy	31	14.8	20.35±5.37		
Acupuncture	30	14.4	20.46±5.70	[b]KW=21.809	**0.001**
Prayer therapy	30	14.4	22.03±5.31		
Aromatherapy	8	3.8	25.45±5.80		
Massage	4	1.9	20.25±7.22		
			Mean±SD		
Age			33.92±74.6		

[a] Independent sample t test, [b] Kruskal Wallis H test, [c] ANOVA test, SD: Standard deviation, HCAMQ: Holistic Complementary and Alternative Medicine Questionnaire.

DISCUSSION

The study revealed that the three most commonly known and utilized T&CM interventions were cupping or leech intervention (38.5%), apitherapy (26%), and acupuncture (19.2%). The mean scores of the nurses' HCAMQ were compared, revealing that those who worked in children's hospitals or services, had chronic diseases or a family history of chronic diseases, had previously used T&CM practices, believed they had recovered with this method, and reported that T&CM practices could be used in children, had a more positive attitude. It is important to note that these findings are objective and based on statistical analysis. The HCAMQ mean scores and subscales were as follows: 21.74±5.91 for the overall questionnaire, 13.97±4.55 for complementary and alternative medicine, and 7.77±2.52 for holistic health (Table 2).

Table 2. Descriptive information and reliability coefficients for the general and subscales of the HCAMQ

Scale and subscale	Cronbach Alfa	Min.	Max.	Mean±SD
HCAMQ	0.76	11	36	21.74±5.91
Complementary and alternative medicine	0.71	6	25	13.97±4.55
Holistic health	0.76	5	16	7.77±2.52

Min.: Minimum, Max.: Maximum, SD: Standard deviation, HCAMQ: Holistic Complementary and Alternative Medicine Questionnaire.

There was a relationship between chronic disease (r=0.100, p=0.043), previous T&CM/CAM use (r=0.164, p=0.001), education level (r=0.117, p=0.038) and mean HCAMQ scores (Table 3).

Table 3. The relationship between some variables and mean HCAMQ score

Variables		(1)	(2)	(3)	(4)
(1) Chronic disease status	r	1	0,702	0,812	0,100**
	p	-	0,019	0,012	**0,043**
(2) Previous use of T&CM/CAM	r	0,702	1	0,107	0,164*
	p	0,019	-	0,080	**0,001**
(3) Level of education	r	0,812	0,107	1	0,117**
	p	0,012	0,080	-	**0,038**
(4) HCAMQ	r	0,100**	0,164*	0,117**	1
	p	**0,043**	**0,001**	**0,038**	-

*Correlation is significant at the 0.01 level (2-tailed), **Correlation is significant at the 0.05 level (2-tailed), HCAMQ: Holistic Complementary and Alternative Medicine Questionnaire.

Although it is known that T&CM is used in various diseases in children[21], the number of studies on the attitudes of nurses towards the use of T&CM in children is very limited. In this study, 51% of the participants reported that T&CM is a method that can be used safely in children. It was determined that all of those who reported having any chronic disease used T&CM. Similarly, 45.9% of the nurses stated that T&CM practices could be used in diseases related to the respiratory system in children. In this study, nurses with chronic diseases had more positive attitudes towards T&CM. Correlation analysis showed a significant relationship. Therefore, the hypothesis H_1 was confirmed. In a study conducted by McCann and Newell in the UK, the rate of use of T&CM in children with chronic diseases was reported to be 40% and 12% in healthy children.[22] Similarly, Ang et al. reported that the rate of T&CM use was 25% in children with asthma and 38% in healthy children.[23] Post-White et al. reported that T&CM was used 47-62% in children with chronic diseases and 36% in healthy children.[24]

T&CM practices

The use of T&CM practices was prevalent among children with chronic diseases and healthy children alike.

According to the nurses, homeopathy was the T&CM method considered safe for use in children with a percentage of 50.7%. Additionally, phytotherapy (14.8%), acupuncture (14.4%), and prayer therapy (14.4%) were also reported as safe T&CM practices for children. Attitudes towards T&CM were found to be associated with previous use of T&CM, confirming hypothesis H2. A study conducted by Gottschling et al. in Germany reported that homeopathy was the most commonly used T&CM method in children, with a usage rate of 25%.[21] Altunç et al. stated that healthcare professionals and parents perceived homeopathic drugs as safe, natural, and effective, leading many physicians to prescribe

these drugs.[25] Hughes et al. reported that phytotherapy and acupuncture were commonly used in both healthy and sick children, which is consistent with previous studies conducted in Europe.[26] Halkón et al. found that nurses employed various practices, including herbal medicines, nutritional supplements, prayer therapy, and meditation, for their patients. It is worth noting that prayer is the most frequently used therapy in Muslim societies. According to Muslim belief, prayer therapy is considered effective in curing diseases, alleviating troubles, and protecting from evil. It is believed to have no harmful effects.[27] 53.1% of the nurses interviewed believed that traditional and complementary medicine (T&CM) practices were effective in alleviating the symptoms of the child's illness and would support other treatments. According to Madsen et al., the main reasons for using T&CM were to strengthen the immune system, achieve physiological relaxation, and promote recovery. According to a report, the use of traditional and complementary medicine (T&CM) provided relief in 27% of patients with chronic diseases.[28] Lindly et al. suggest that T&CM practices are often sought out when medical treatments are perceived as insufficient or when patients desire to increase their effectiveness.[29] Although various T&CM practices are used in different studies, sociocultural characteristics, religion, lifestyle, and the use of local medicinal herbs are believed to influence the choice of T&CM method.[30] This study found that herbal practices, which are a cultural habit in Turkey, are applied more frequently than other T&CM practices. Additionally, most of the population believes that these practices are healthy and safe, which is consistent with previous studies.

The study found that individuals with higher levels of education tend to exhibit positive health behaviors. Specifically, nurses who received both undergraduate and postgraduate education scored lower on the T&CM attitude scale, indicating a more positive attitude towards T&CM. Additionally, the study confirmed the hypothesis that level of education is related to T&CM. Crawford et al.[31] reported that individuals with higher education and income levels had higher rates of T&CM use. The authors suggest that higher education levels may be associated with greater access to information about the effectiveness of these treatment practices. The study also found that newspapers, magazines, and media programs were the primary sources of information about T&CM. According to Holroyd et al.[32], newspapers and magazines were the primary sources of information regarding T&CM. The study suggests that the abundance of information obtained from the media may be attributed to its accessibility, the inclusion of T&CM-related content, and the increased media follow-up rates.

It has been documented that certain T&CM practices can be costly, leading to their use primarily by individuals with higher socioeconomic status.[7] However, some researchers have argued that the effectiveness of these practices may outweigh their cost.[33] In this study, nurses who reported having good socioeconomic status also reported a more positive attitude towards T&CM.

Among all users, 75% consulted a physician regarding the use of T&CM, and 84.6% recommended T&CM to others. These findings contradict studies reporting that most T&CM users act without the approval of healthcare professionals.[7,34] This result may be due to the fact that the participants were health personnel and therefore more knowledgeable about T&CM-related practices. According to Gottschling et al., 48% of physicians recommended the use of T&CM in children.[21] Additionally, 60% of general practitioners and 36% of pediatricians had a positive attitude towards the use of T&CM in children. Samuels et al. reported that 70% of nurses used T&CM, with approximately half of them recommending it to their patients.[35] According to a report, healthcare professionals are more likely to recommend T&CM to others when they witness its positive effects on children.[36] This may be due to the perception that T&CM is a natural, personalized, non-invasive, and holistic approach. The use of clear and concise language with a logical flow of information is important in conveying this message. Many healthcare professionals believe that T&CM practices are tested for quality and side effects and are more reliable than modern practices.[37] Nurses can benefit from T&CM practices in the context of spiritual care to ensure the psychological and emotional well-being of the patient, reduce stress, and facilitate compliance with treatment.[38] Such practices can be beneficial to the patient because they have no adverse effects.

CONCLUSION

T&CM is accepted as a very common method that supports modern medical practices in both sick and healthy children. Although side effect rates are generally low, it has been reported that uncontrolled and irregular T&CM practices may lead to many problems and deaths.[21] Although interactions between herbal mixtures and prescription drugs have

been demonstrated by studies, it should be kept in mind that some T&CM practices should be used with caution in vulnerable groups such as children. Since a T&CM method contraindicated for a child may delay the diagnosis or treatment process of the disease, caution should be exercised, and a decision should be made to apply such practices after a detailed evaluation for each child. With spirituality, the health care providers can learn to support the values for the art of healing. Nurses and health professionals should be trained to integrate spiritual care with T&CM practices to understand patients' needs and determine the best treatment approach.

Limitations

There are several limitations to this study. The fact that the study participants were nurses working in two hospitals in only one province limits the generalizability of the findings to the population. In addition, causality cannot be inferred from this study because of the cross-sectional design of the study. Therefore, longitudinal studies with large numbers of participants are needed. Another limitation is that the data were collected using self-report questionnaires. These limitations should be considered in future studies. Despite these limitations, the strength of the study is that it is the first study to obtain data on nurses' attitudes toward the use of T&CM in children.

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ORIGINAL RESEARCH

Immediate Effect of Non-Elastic Taping on Gait Balance in Stroke Patients: Randomized Controlled Trial

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Abstract

Objective: After a stroke, most patients have poor ankle control and difficulty walking. Considering that proper foot placement will provide a more balanced and controlled gait, the aim of this study was to investigate the immediate effect of non-elastic ankle taping providing eversion support on gait balance in stroke patients.

Material-Method: The study included 30 stroke patients. Participants were randomly assigned to two groups: intervention group (n=15) and the control group (n=15). The control group received 45 min of conventional physiotherapy. The intervention group received 45 min of conventional physiotherapy after nonelastic taping, which provides eversion support. The gait balance of both groups was evaluated using the Dynamic Gait Index before and after treatment.

Results: A significant difference was found in the Dynamic Gait Index total score of the intervention and control groups before and after treatment ($p<0.05$). In the intervention group, a significant difference was found in all items of the Dynamic Gait Index before and after treatment ($p<0.05$). In the control group, a significant difference was found in the 4th and 8th items of the Dynamic Gait Index before and after treatment ($p<0.05$). There was no significant difference between the intervention and control groups in the total score and the separate scores of the eight items of the Dynamic Gait Index before and after treatment ($p>0.05$).

Conclusion: Nonelastic taping of the ankle before the physiotherapy session had a positive immediate effect on improving gait balance in stroke patients. The long-term effects of nonelastic taping on different gait parameters in stroke patients should be investigated.

Keywords: Balance, Gait, Immediate, Stroke, Taping

INTRODUCTION

Stroke is a pathology characterized by a sudden onset of neurological deficit, typically due to cerebral infarction or, less frequently, intracerebral hemorrhage. It is one of the main causes of mortality and the main neurological cause to acquired disability in adulthood.[1]

Hemiplegia (body paralysis on the left or right side), central facial paresis, and hemiparesis (body weakening on the left or right side) are common motor issues following stroke.[2] There is a direct relationship between motor impairment and function.[3] According to reports, 70% of stroke patients walk slowly three months following their stroke.[4] Post-stroke gait difficulty leads to reduced independence in activities of daily living and participation in social activities. Therefore, one of the most important goals of rehabilitation after stroke is to restore the gait pattern and optimize walking speed.[5, 6]

The ankle joint is essential for maintaining balance during gait.[7] In the paretic ankle joint, muscle weakness and spasticity are observed due to decreased neural stimulation. This condition is often accompanied by 'drop foot', characterized by plantar flexion of the foot and dragging on the ground during walking.[8] As a result, people with clubfoot are likely to either walk with excessive flexion of the hip and knee joints or walk with a circumduction movement outward from the midline with the affected lower extremity, putting body weight on the intact side.[9] These asymmetrical gait patterns cause gait disturbances, resulting in reduced walking speed[10], increased risk of falls[11]and greater energy expenditure.[12]

Another condition encountered in individuals after stroke is the presence of spastic equinovarus foot.[13]

The posterior foot muscles' imbalanced strength as a result of muscular hypertonus and the lack of efficient motor control causes the ankle posture in plantar flexion and inversion. The gastrocnemius and soleus muscles contract excessively in the equinovarus foot, whereas the tibialis anterior and peroneal muscles have paresis or weakening.[14] However, dorsi flexion is restricted in stroke patients with plantar flexor spasticity, making it challenging for the afflicted heel to make touch with the ground while standing and exercising. This is a major issue that not only affects the recovery process but also lowers quality of life.[15] Furthermore, stroke patients with spasticity has difficulty in maintaining postural control and inducing appropriate muscle strength and performing other movements.[16]

In rehabilitation; pharmacotherapeutic agents[17] transcutaneous electrical stimulation[18] and taping[19] are used to reduce the intensity of spasticity, while functional electrical stimulation[20] and foot-ankle orthosis[21] are used for drop foot treatment. Taping is one of the most economical and simple treatment methods that anybody may use without experiencing any negative side effects.[22] In order to maintain the balance between the agonist and antagonist muscles during voluntary movement, tape may also regulate muscular tone.[23]

Tapes are basically divided into two groups: non-elastic (rigid) and elastic tapes, each with its own mechanical properties, theoretical purposes and application techniques. Non-elastic tape was the first type of tape to be used and continues to be used today as an assistive method in the treatment of musculoskeletal injuries. The mechanism of the effect is to increase proprioception and protect muscles and joints by providing support.[24] In order to improve strength following musculoskeletal problems, it is frequently utilized to adjust joint alignment and stimulate muscle activation.[25] It has been shown that gluteal tape has an immediate impact on stroke patients' hip extension during the stance phase.[26]

In the current study, we aimed to assess the acute impact of eversion-supporting non-elastic taping on gait balance for stroke patients on the affected side ankle in order to provide a smoother and more regulated gait.

MATERIALS AND METHODS

Participants and setting

The current study, designed as a randomized controlled clinical study, was conducted in the Department of Physical Therapy and Rehabilitation at NP ISTANBUL Brain Hospital between July and December 2022. 30 individuals with stroke who had been identified by computed tomography or magnetic resonance imaging made up the study population, 15 individuals in the rigid banding group and 15 individuals in the control group, who continued to receive inpatient or outpatient physical therapy. Inclusion criteria were; been diagnosed with a stroke at least 6 months ago, being between the ages of 18 and 75, having a spasticity grade of 0, 1, 1+, 2 according to the Modified Ashworth Scale, having no cooperation problems and being mobilized without support. Exclusion criteria were; orthopedic problems such as surgical intervention, fracture history, presence of cognitive, visual, or cardiovascular diseases and skin sensitivity in the foot and ankle that may affect gait.

Sample size and randomization

A posthoc power analysis (G*Power 3.0.) was performed using variables related to outcome measures to determine the difference between the groups with sample size (Group 1=15, Group 2=15), α value of 0.05, effect size of 0.50. Posthoc power (1-β) was determined as 80% in the power analysis results.[27] The probability of error was accepted as $p<0.05$. Before randomization, baseline measurements of patients' abilities were performed. An independent blinded researcher assigned the participants to two groups: experimental and control using a simple randomization method via a computer-generated list.

Treatment program

The control group received a 45-min conventional physiotherapy program including range of motion exercises, balance and gait training, and neuromuscular electrical stimulation. The intervention group was taped at the beginning of the treatment and then received conventional physiotherapy with the same content as the control group.

Non-elastic taping was placed on the ankle of the affected side with a plaster band starting from the middle of the sole of the foot and extending from the lateral side of the foot to the level below the knee to provide eversion support. The method for applying a non-elastic ankle band is as follows: First, the tape is applied on the plantar surface of the foot to cover the calcaneus. Then, the foot is placed in the neutral position and in this position, the tape is stretched over the lateral malleolus and brought to 5 cm below the fibular head. To keep the tape in place, it is fixed with short bands just above the lateral malleolus and at the top of the tape (Figure 1).[28]

Figure 1. Non-elastic ankle taping

Data collection tools

A clinical and sociodemographic information form (including age, gender, educational status, medical history, etc.), the Modified Ashworth Scale (MAS) to assess spasticity, and the Dynamic Gait Index (DGI) to assess dynamic balance during walking were used in the evaluation. A physiotherapist with more than 10 years of professional experience performed non-elastic taping and conventional physiotherapy. A different physical therapist with two years of clinical experience conducted the evaluations.

Clinical and socio- demographic information form

Through this form, demographic information (age, height, weight, etc.) and clinical information such as spasticity level, medical history, presence of aphasia and use of assistive devices were questioned.

Dynamic gait index (DGI)

It was designed in 1995 by Shumway-Cook and Woollacott to assess dynamic balance while walking.[29] The scale has been translated and adapted into Turkish.[30] According to studies, the dynamic walking index is a valid and safe tool for chronic stroke patients.[31]

The dynamic gait index includes 8 items: walking, walking at different speeds, crossing an obstacle, walking around an obstacle, suddenly turning 180 degrees while walking and stopping, climbing steps, walking by turning the head left and right in the horizontal plane, and walking by turning the head up and down in the vertical plane. The performance of each item was graded with 4 points. The score scale is as follows; 3 independent walking, 2 mild impairment, 1 moderate impairment and 0 severe impairment; the total score that can be obtained varies between 0-24 points. If the total score is between 22 and 24, it can be said that individuals have safe ambulation, 20-21 points are considered to be a harbinger of fall risk, and falls are more common when a person receives a score of 19 or lower.[30-33]

Ethical considerations

The Üsküdar University Non-Interventional Research Ethics Committee accepted this study with a decision dated May 27, 2022, and numbered 61351342. This study was carried out in compliance with the ethical guidelines outlined in The World Medical Association (WMA) Declaration of Helsinki. Permissions were obtained from the chief physician of the hospital where the study was conducted. A detailed description was given to every patient taking part in the study of the study's purpose, procedures, and measurements, and they provided written consent before participating.

Statistical analysis

The data were statistically analyzed using SPSS 11.5 (Statistical Package for Social Sciences). Qualitative data were reported as percentages (%) while quantitative data were expressed as mean and standard deviation (SD). The conformity of the data to normal distribution was examined by 'One Sample Kolmogrov-Simirnov Test' and 'Histogram Graph'. Mann-Whitney U test was used for comparisons between groups and comparisons within groups were made using the Wilcoxon signed rank test. The standard deviation for statistical significance was set at 0.05.

RESULTS

The study included a total of 30 stroke patients: 15 in the control group and 15 in the intervention group (non-elastic taping). The intervention group's mean age was 51.13±12.08 years, compared to the control group's mean age of 64.40±10.54 years. Height, weight, and body mass index, which serve as defining characteristics of the patients, were comparable between the groups ($p>0.05$) (Table 1).

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Table 1. Demographic characteristics

		CG (n=15)	IG (n=15)
		Mean±SD	**Mean±SD**
Age (Year)		64.40±10.54	51.13±12.08
Height (m)		1.69±0.92	1.68±0.07
Weight (kg)		74.67±9.53	71.53±11.97
BMI (kg/m²)		2.14±3.87	25.45±4.19
		% (n)	% (n)
Gender	Female	40(6)	46.7(7)
	Male	60(9)	53.3(8)

SD: standard deviation, n: numbers of ındividuals, m: meter, kg: kilogram, BMI: Body Mass Index

Clinical characteristics of the participants such as affected side, presence of aphasia, orthosis use and spasticity levels are given in Table 2.

When the Dynamic Gait Index total score of the intervention and control groups was compared within the group before and after treatment, a substantial improvement in both groups' scores was found ($p< 0.05$). All elements of the Dynamic Gait Index significantly increased in the intervention group following therapy ($p <0.05$). Only the 4th and 8th items of the Dynamic Gait Index in the control group showed a significant improvement after therapy ($p< 0.05$). The total score and individual scores of the eight items of the Dynamic Gait Index after treatment did not significantly differ between the groups ($p>0.05$) (Table 3).

Table 2. Clinical characteristics

		CG (n=15) %(n)	IG (n=15) %(n)
Affected Side	Right	40(6)	33.3(5)
	Left	60(9)	66.7(10)
Aphasia	Yes	40(6)	46.7(7)
	No	60(9)	53.3(8)
Orthosis	Yes	6.7(1)	20(3)
	No	93.3(14)	80(12)
MAS	1	53.3(8)	20(3)
	1+	20(3)	33.3(5)
	2	26.7(4)	46.7(7)

n: numbers of individuals, %: percentage, MAS: Modified Ashworth Scale

Table 3. Intragroup and inter group comparasions

DGI (score)		CG (n=15)		IG (n=15)		p
		Mean±SD	**p**	**Mean±SD**	**p**	
Total	BT	16.86±3.94	**0.001**	14.86±4.40	**0.001**	0.211
	AT	18.66±4.08		18.86±3.11		0.917
Item 1	BT	2.60±0.50	0.317	2.40±0.50	**0.014**	0.281
	AT	2.66±0.48		2.80±0.41		0.417
Item 2	BT	2.40±0.82	0.157	2.20±0.77	**0.005**	0.416
	AT	2.53±0.74		2.73±0.45		0.552
Item 3	BT	2.33±0.48	0.317	1.73±0.59	**0.033**	**0.008**
	AT	2.40±0.50		2.26±0.59		0.562
Item 4	BT	2.33±0.61	**0.046**	2.06±0.59	**0.02**	0.224
	AT	2.60±0.50		2.53±0.51		0.717
Item 5	BT	2.06±0.59	0.14	2.00±0.65	**0.005**	0.771
	AT	2.46±0.51		2.53±0.51		0.720
Item 6	BT	1.53±0.83	0.157	1.46±1.06	**0.02**	0.844
	AT	1.66±0.81		1.93±0.88		0.351
Item 7	BT	2.00±0.75	0.083	1.66±0.72	**0.002**	0.273
	AT	2.20±0.67		2.33±0.72		0.555
Item 8	BT	1.60±0.50	**0.005**	1.33±0.72	**0.008**	0.326
	AT	2.13±0.74		1.80±0.77		0.231

SD:Standard Deviation, n: numbers of individuals, DGI: Dynamic Gait Index, BT: Before treatment, AT: After Treatment, $p<0.05$ statistically significant differance

DISCUSSION

This study investigated at how non-elastic ankle tape affected individuals with chronic strokes' gait balance acutely and how it contributed with rehabilitation. In the taping group, there was a significant intragroup increase in all parameters of the Gait Balance Index and a significant improvement in the 3rd item of the Gait Balance Index between the groups in favor of the intervention group. In summary, it was found that non-elastic ankle tape prior to physiotherapy had a favorable acute impact on gait balance in stroke patients. These results are particularly noteworthy because there is little information about the short-term effects of nonelastic tape on gait balance in chronic stroke patients.

Stroke is the primary cause of chronic disability.[34] The consequences of stroke include impairments in strength, balance, communication, and cognitive disorders; impairments in activities of daily living and gait.[35,36] Among all these effects associated with stroke, most patients consider gait disturbance to be one of the most important problems.[37] Accordingly, gait improvement is reported as the most common goal for rehabilitation.[38]

In post-stroke therapy, kinesiologic taping benefits the lower extremity.[39] Kinesiologic taping of the ankle after stroke has been reported to acutely improve walking function.[40] Additionally, studies on patients with chronic stroke have looked into the effects of nonelastic ankle tape. One study demonstrated that patients with chronic stroke benefited from nonelastic ankle taping in terms of walking speed and stride length. It has been proposed that nonelastic ankle taping acutely improves walking ability by stabilizing the ankle.[19] Our findings are consistent with this study. In another study, it was found that gait function improved acutely in chronic stroke patients after taping providing ankle eversion support; walking speed, stride length, and cadence increased significantly compared to the non-taping group.[41] According to a research by Kim et al., taping the lower extremity that was injured after a stroke improved the patient's characteristic asymmetric gait and walking speed.[42] Another study suggested that kinesiological taping might be helpful for stroke patients undergoing rehabilitation, especially for enhancing balance and mobility.[43] In our study, in accordance with previous studies, inelastic ankle taping was found to have a positive acute effect on gait in individuals with chronic stroke, and dynamic walking balance was found to improve acutely because of this method.

The acute effect of non-elastic ankle taping on gait balance in addition to a conventional physiotherapy programme may be due to the improvement in ankle stability provided by the tape. Another explanation may be that taping provides an increase in cutaneous sensory input. One study reported that tactile input added to exercise training can significantly improve double-support time.[44] Tactile input can activate fast conducting sensory and proprioceptive fibres to initiate a faster muscle response.[45] In our study, a non-elastic tape was applied to the ankle of the affected side, starting from the middle of the sole and extending down the side of the foot to below the knee. Individuals in the intervention group reported that they could easily feel a stimulus from the non-elastic tape stretching the skin during the exercise, which made it easier to move the ankle. We believe that this may have some benefits for motor relearning.

Several studies have been conducted with the goal of enhancing stroke sufferers' quality of life. It has been established that functional ability, particularly balance and walking ability, is a significant determinant of a stroke patient's quality of life. The quality of life of stroke patients is significantly impacted by social isolation, balance issues, and gait difficulties. In programs intended to improve stroke sufferers' quality of life, it has been stated that balance and gait metrics should be taken into account.[46] Our current study is important in this regard and has the thinkable to improve quality of life through long-term follow-up.

CONCLUSION

The non-elastic band that provides eversion support to the ankle was found to acutely improve the walking balance of stroke patients. In clinical practice, this intervention is recommended for short-term goals in stroke patients. However this research has several limitations. The learning effects of walking could not be assessed, nor could it be determined that the learning effect was completely excluded. Further research should consider additional outcomes, longer treatment, and continuous observation. The long-term effects of this intervention and its effects on different walking parameters should be investigated.

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ORIGINAL RESEARCH

Immediate Effects of Cervical Mobilization on Acoustic Properties and Performance in Voice Training Students

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Abstract
Objective: This study aimed to investigate the immediate effects of cervical mobilization on acoustic properties and performance in female voice training students.
Material-Method: Fifteen female volunteer students participated in the research. The study evaluated the acoustic properties of the voice, performance, and cervical mobility. A single session of cervical mobilization was administered by an experienced physiotherapist, after which assessments were repeated.
Results: There was a significant increase in cervical flexion-extension (p=0.002), rotation (p=0.001), and lateral flexion (p=0.006) range of motion measurements after treatment compared to pre-treatment measurements. Head register analysis revealed a significant increase in mean pitch frequency measurements after treatment compared to pre-treatment measurements (p=0.036). Expert opinions obtained through interviews indicated a significant improvement in acoustic performance in the post-treatment status compared to the pre-treatment status (p=0.001).
Conclusion: This study observed that a single session of cervical mobilization positively affected both acoustic performance and cervical mobility.
Keywords: Manual Therapy, Voice Training, Cervical Mobility

INTRODUCTION

The most basic tool of communication is sound. However, our vocal cords are located in the larynx, a region of our body that we cannot see, and are surrounded by bone, muscle and cartilage tissue around it.[1] Training the voice is a very difficult process, both because we cannot see it and because it is directly affected by many changes in the body. In addition to overcoming technical difficulties, a relaxed mind and body are required for the correct and effective use of voice, especially for those who use their voice professionally.[2]

The practical use and improvement of the current professional competencies of voice training students are significantly related to their practice habits, self-regulation skills, and attitudes in their fields of study.[3] Voice training, as an important dimension of music education, consists of a process for achieving certain technical gains such as imagination.[4] Individuals who sing produce sound using their whole body, not just their vocal muscles. Therefore, it is necessary to learn to sing with the whole body, to use the breath correctly, to be aware of the body and to know the body well. More controlled singing is directly proportional to greater body awareness and control. Singers who are aware of their bodies and know how to relax their muscles and joints will be more successful.[5]

During vocal training exercises, internal and external softening of the body should be ensured. The beauty that will appear in the expressions during singing is directly proportional to the right presentation, the comfort of the body and the attention. The mind must be active, the sound producing organs must be ready to make the necessary expansions. It is particularly important to relax the neck, where the vocal chords are located.[6]

Excessive use of the muscles around the neck, one of the organs we use constantly, prevents the maintenance of a comfortable posture and a balanced head position. Since a balanced posture directly affects sound production, tense neck muscles can force the sound and lead to incorrect phonation. For this reason, harmony between the muscles surrounding the neck and a balanced head position are very important in phonation.[5] Especially for singers, tension in the neck, shoulder and larynx

muscles directly affects sound production and prevents the correct and desired sound formation. The fact that the body is comfortable and the muscles are free of tension has a positive effect on the tone quality of the voice.[8]

The cervical suboccipital muscles have been shown to have 36 muscle spindles per gram of muscle tissue, compared to 0.7 spindles per gram in the gluteus maximus.[9] The high number of stretch receptors in these tissues and their essential link from eye movements to coordination of the rest of the back muscles ensures their central role in cognitive performance.[10] A randomised controlled trial concluded that cervical mobilisation had a significant benefit on attention and anxiety in patients with cervical postural disorders.[11] Neck disorders (ND) are recognised as a common public health problem in the modern world, and although their lifetime prevalence is approaching 50%, they are often seen in young populations. Neck disorders are defined as severe discomfort in the lateral and posterior regions of the neck lasting more than 3 months, resulting from poor posture, degenerative and mechanical changes. ND causes disability, limitation of activities of daily living, job dissatisfaction and increased economic and social costs.[12]

Various modalities such as physiotherapy, exercise, massage, chiropractic, spinal mobilisation and manipulation are used in the treatment of musculoskeletal disorders.13 Manual therapy (MT) is an increasingly popular treatment for people with ND.[14] MT includes both passive and active techniques. Palmgren et al concluded that manual therapy had a positive effect on proprioception and pain in patients with neck disorders.[15] In another randomised controlled trial, Zaproudina et al showed that mobilisation techniques reduced disability in patients with chronic neck disorders.[16] Cleland et al also reported that thoracic spinal manipulation had analgesic effects in people with mechanical neck disorders.[17] Sound is produced by the coordinated work of the inspiratory and expiratory muscles. As the expiratory muscles originate from the cervical region, mobilisation of this region in non-symptomatic individuals will affect acoustic performance. As there are more sensory receptors in the cervical region than in other regions of the body, even a single session of mobilisation of this region has a direct effect on acoustic performance.[11]

It has also been shown that cervical mobilisation can have concomitant effects on motor function and autonomic nervous system function in subjects with musculoskeletal disorders.[11]

Based on the studies in the literature, the aim of this study was to investigate the immediate effects of cervical mobilisation on the acoustic properties and performance of voice training students.

MATERIALS AND METHODS

Materials

The participants' sex, age, height, weight and body mass index were recorded. The acoustic properties of the voice, performance and cervical spine mobility were then assessed.

Acoustic measurements

Participants' voices were recorded using a Shure PG57 microphone and Audacity software. Prior to voice recording and cervical mobilisation, the participants were given voice exercises. The recordings were made in a quiet room. During the recording, the distance between the mouth and the microphone was set at 15 cm and the microphone was placed under the mouth at an angle of 45°. Participants were asked to produce the sound /a/ at a sampling rate of 44,100 Hz in four voices: chest, middle, head and speech. The measurement was repeated three times for each register. Each recording was repeated three times and the best recordings were analysed. The recordings were made by a music education researcher. Mean pitch, jitter, shimmer and harmonics to noise ratio (HNR) were analysed. Mean pitch is the lowest rate of vibration produced by the vocal folds during phonation and is expressed in Hz. Hz is the number of vibrations per second. As the fundamental frequency increases, the pitch becomes thinner, and as the fundamental frequency decreases, the pitch becomes thicker. Jitter is the irregularity in the vibration of the vocal cord. It is generally found to be increased in patients with voice disorders. Flicker refers to the change in sound intensity from glottal cycle to cycle. It is usually found to be increased in voice patients. HNR is the ratio of harmonics to noise. Harmonics are frequencies that are integral multiples of the fundamental frequencies.18 The audio recordings obtained were analysed using the Praat program. The sounds marked in Figure 1 were identified and recorded in the chest, middle and head registers.

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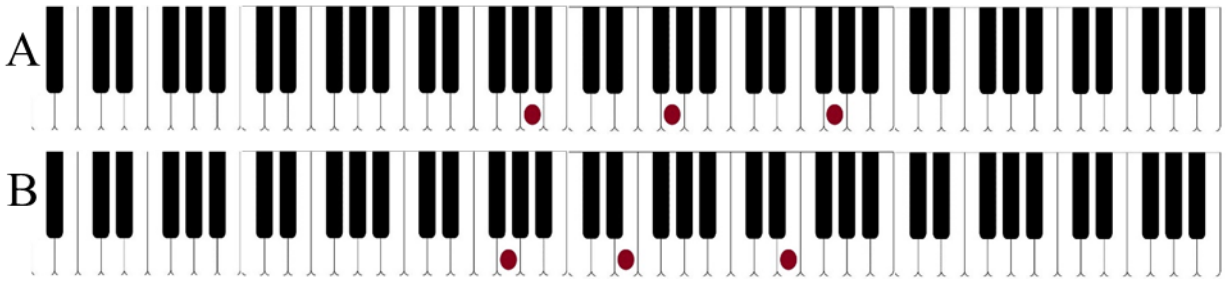

Figure 1. A: Sounds recorded from the chest, middle and head registers for soprano voices, B: Sounds recorded from the chest, middle and head registers for alto voices

Performance evaluation

The participants performed their most recent works, appropriate to their level, in a quiet room. During the recording, they performed by listening to the piano accompaniment of the piece through headphones in one ear and video recordings were made. The video recordings were evaluated by two experts in the field of vocal training; musicality, technique, correct use of breath, correct use of body, legato singing, style and interpretation, and their opinions were obtained by interview.

Cervical mobility

Cervical mobility was measured by a physiotherapist using a universal goniometer. In the sitting position, flexion-extension, right-left lateral flexion, right-left rotation and active range of motion were measured (Figure 2).

Intervention

Cervical mobilisation was performed by an experienced physiotherapist after the initial assessment of the participants. As the expiratory muscles originate from the cervical region, mobilisation of this region in non-symptomatic individuals affects acoustic performance. As there are more sensory receptors in the cervical region than in other regions of the body, even a single session of mobilisation of this region has a direct effect on acoustic performance. The Cyriax technique is a low-risk form of physiotherapy that can be used to quickly and effectively reduce pain caused by injury or illness.[11] The Cyriax manipulation protocol is used in conjunction with cervical isometrics and muscle stretching. This technique is performed in a comfortable lying position with the head slightly off the bed. Initial pre-manipulative massage is applied to the mid-cervical region with the fingers on the contralateral side and the thumb on the ipsilateral side. The massage is performed by simultaneously flexing and extending the wrist in the skin.

Cervical mobilisation consists of flexion-extension, right-left lateral flexion, right-left rotation, antero-posterior gliding, medio-lateral gliding and spinal traction with the patient in the supine position. Each mobilisation is performed 5 times and traction for 20 seconds. The physiotherapist controls the speed of the movement, the smoothness of the angle and helps to perform the movement correctly (Figure 3).

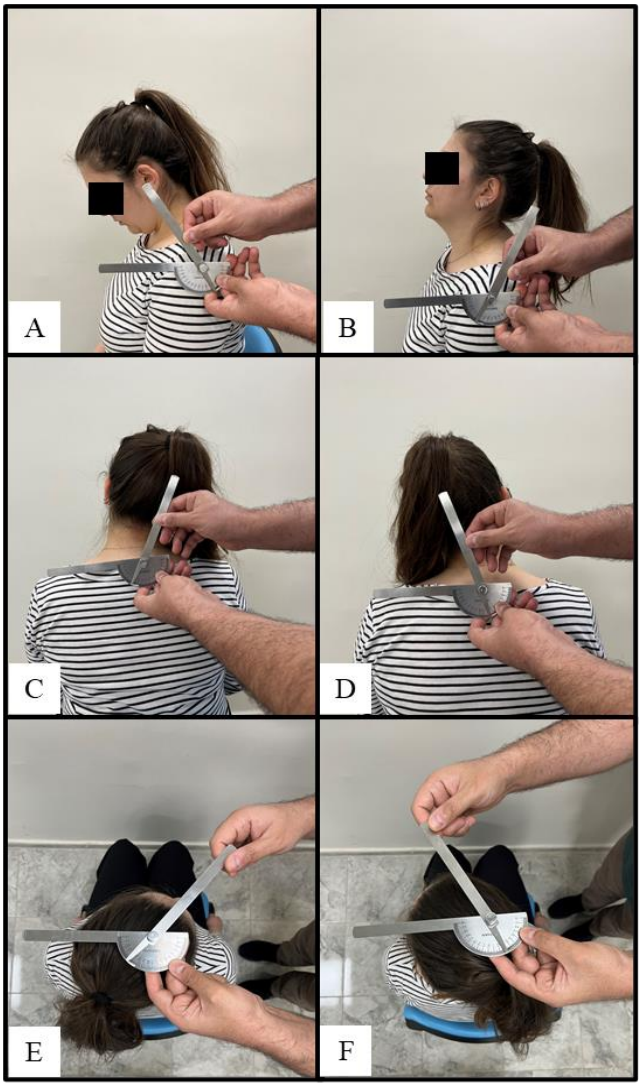

Figure 2. Cervical mobility measurements: A) Flexion, B) Extension, C) Lateral flexion-right, D) Lateral flexion-left, E) Rotation-right, F) Rotation-left

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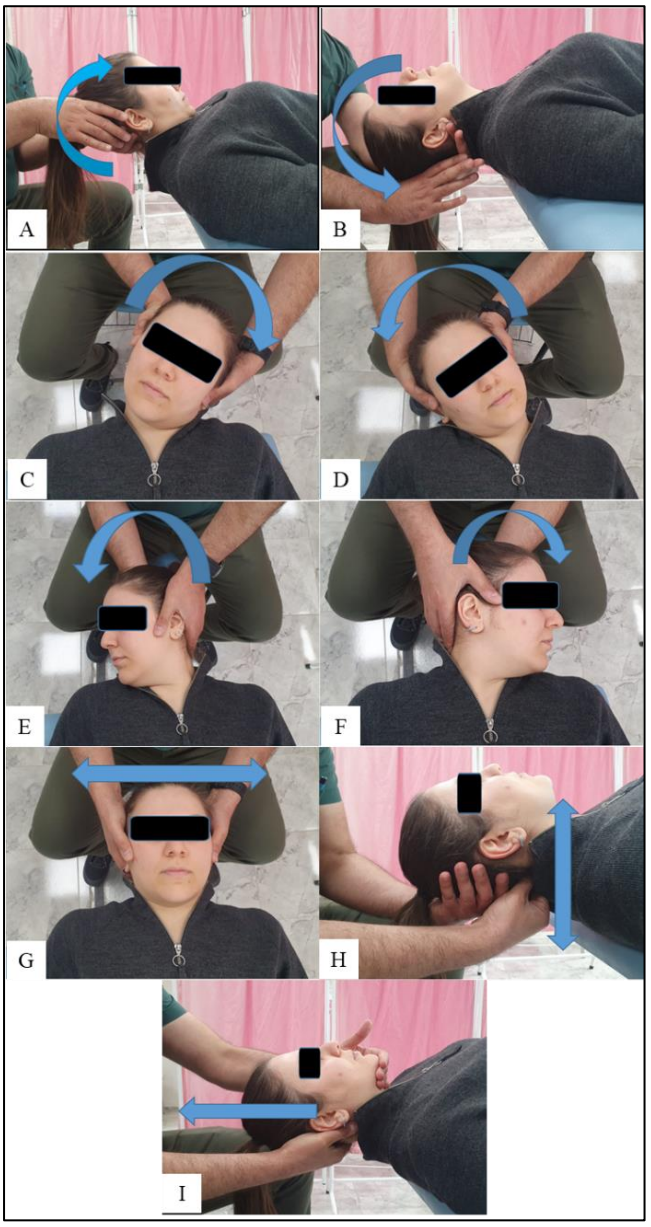

Figure 3. Cervical mobilization intervention: A) Flexion, B) Extension, C) Lateral flexion-left, D) Lateral flexion-right, E) Rotation-right, F) Rotation-left, G) Medio-lateral gliding, H) Antero-posterior gliding, I) Traction.

Statistical analysis

Version 3.1.9.4 of the G*Power programme (Heinrich-Heine-Universita¨t Dusseldorf, Germany) was used to determine the sample of the study. To achieve 80% power (1 - β error probability) with an α error level probability of 0.05, IBM SPSS Statistics 22.0 was used to analyse the results. Descriptive analyses were presented using median, minimum and maximum values for the non-normally distributed variables. Wilcoxon tests were used to compare measurements of acoustic measures, performance and cervical mobility before and after cervical mobilisation.

RESULTS

The demographic characteristics of the participants are shown in Table 1. Comparison of cervical mobility, performance and acoustic properties of the voice before and after cervical mobilisation are shown in Table 2.

Table 1. Demographic properties of the participants.

Variables	Median (Min.-Max.)
Age (years)	24 (19-40)
Height (m)	1.65 (1.58-1.72)
Weight (kg)	61 (47-98)
Voice Type (n)	12 soprano, 3 alto

n: number of participants, m: meter, kg: kilogram.

There was a significant increase in cervical flexion-extension, rotation and lateral flexion range of motion measurements after treatment compared to pre-treatment measurements. While the highest significance was for rotation (P = 0.001), the lowest significance was for lateral flexion (P = 0.006), (Table 2).

According to the chest register analysis, there were reductions in jitter, shimmer and mean HNR measurements after treatment based on pre-treatment measurements. However, there was no significant difference in any of the breast register parameters (Table 2).

According to the head register analysis, there were no reductions except for jitter and shimmer. However, there was a significant increase in mean pitch frequency measurements after treatment compared to pre-treatment measurements (P=0.036) (Table 2).

When analysing the speech data, although there was an increase in post-treatment measurements compared to pre-treatment measurements for mean pitch and mean HNR, no significant difference was found (Table 2).

As a result of the analysis of the middle register data, no significant difference was found for any of the parameters (Table 2).

Table 2. Comparison of cervical mobility and acoustic properties of voice before and after cervical mobilization.

Variable	Pre Median (IQR)	Post Median (IQR)	p
Cervical Mobility			
Flexion-Extension (˚)	90 (80-95)	100 (90-105)	**0.002***
Rotation (˚)	115 (90-120)	120 (110-135)	**0.001***
Lateral Flexion (˚)	70 (60-80)	80 (70-90)	**0.006***
Chest Register			
Mean pitch (Hz)	219.25 (215.24-223.55)	220.27 (216.15-222.90)	0.191
Jitter (%)	0.17 (0.11-0.20)	0.16 (0.12-0.29)	0.609
Shimmer (%)	4.70 (3.97-7.14)	5.67 (4.42-7.59)	0.570
Mean HNR (dB)	22.44 (19.07-25.56)	22.35 (19.26-24.25)	0.609
Head Register			
Mean pitch (Hz)	394.27 (371.06-396.69)	395.07 (379.85-399.39)	**0.036***
Jitter (%)	0.19 (0.12-0.33)	0.12 (0.06-0.25)	0.379
Shimmer (%)	4.94 (3.58-6.78)	3.56 (2.15-6.80)	0.088
Mean HNR (dB)	26.72 (21.66-29.16)	28.99 (23.48-33.41)	0.078
Speaking			
Mean pitch (Hz)	211.45 (198.79-230.44)	214.93 (199.49-223.48)	0.776
Jitter (%)	0.16 (0.15-0.23)	0.16 (0.13-0.27)	0.307
Shimmer (%)	6.38 (4.73-6.92)	5.45 (4.20-8.33)	0.470
Mean HNR (dB)	20.98 (19.47-22.23)	21.27 (19.86-22.42)	0.255
Middle Register			
Mean pitch (Hz)	391.01 (385.41-396.03)	391.29 (388.83-397.12)	0.570
Jitter (%)	0.21 (0.19-0.48)	0.23 (0.18-0.38)	0.514
Shimmer (%)	4.87 (3.64-6.34)	3.50 (2.97-5.70)	0.156
Mean HNR (dB)	23.16 (21.14-26.27)	25.65 (22.47-27.15)	0.427
Performance (%)	65.00 (62.49-78.33)	79.58 (73.74-89.58)	**0.001***

*: p<0.05, IQR: Interquartile range, HNR: Harmonics to Noise Ratio

Voice Training Expert 1

It is noticeable that after the application all the students had a relaxed appearance, especially in the neck and face, their resonance areas were more open and their breathing support was much better, they could sing more legato, there was a controlled increase in their vocal intensity and they were more physically comfortable. Whilst it can be seen that their breath control is weaker before the application, especially when they try to get support from their necks, the voice is heard to be breathy. Before the application it is seen that they could not maintain their position in low voices because their breathing support was weak and uncontrolled, and the voice dropped frequently, had difficulty in high voices and maintaining tone. As the breathing support is better after the application, it is seen that the dropping of the voice is much less, and they are more comfortable and controlled when making a high pitched sound, and they maintain the position of the sound.

Voice Training Expert 2

Before the application some of the students could hear detonations and after the application it was observed that they were able to stay in tune as the student provided better breathing support. Before the application, the students' concentration on the work was weaker and it was observed that their mastery of the work increased after the application. Before the application, most of the students were weaker in providing body posture and singing position with breathing support, but after the application it was observed that the body posture and singing positions were more accurate because they could provide better breathing support. They were also observed to be more successful in performing legato. After the application, it was observed that the more correct behaviour of the students increased their musicality, but it was also seen that they could better reflect the stylistic features of the works.

According to the experts' opinions, based on the interview results, there was a significant increase in performance in the post-treatment status compared to the pre-treatment status (P = 0.001), (Table 2).

DISCUSSION

In this study, acoustic analysis of speech, chest, middle and head registers was performed before and after cervical mobilisation. According to the analysis results, no significant difference was observed in the parameters jitter, shimmer and HNR. On the other hand, a significant difference was observed in the mean pitch (fundamental frequency - F0) parameter

of the voices recorded as the head register.

In contrast to our findings, Fachinatto reported that no difference in sound quality was observed in perceptual auditory assessment or acoustic assessment after a single spinal manipulative intervention applied to the thoracic and cervical spine in their study of 29 male participants performing similar singing activities.[20] Kar analysed the effects of body awareness and kinetic exercises on sound production in voice training and, similar to this study, analysed voice recordings from the speech, chest, middle and head registers with the Praat analysis program. The analysis evaluated mean pitch (fundamental frequency), jitter, shimmer and HNR parameters, but no significant difference was found in mean pitch and jitter parameters. On the other hand, a significant difference was found for shimmer and HNR values, and an increase was observed for the shimmer parameter, while a decrease was observed for the HNR parameter.[21] Although these studies have reported conflicting results as to whether manual therapy or exercise is effective in improving acoustic properties, according to the results of the current study, a statistically significant improvement was found for all cervical range of motion scores. However, only the mean pitch parameter of acoustic properties showed a statistically significant improvement.The effectiveness of mobilisation applications becomes apparent after a minimum of 6 sessions. This may be one reason why no differences were found in the acoustic parameters.

In one study, the mean scores of the study group were examined in terms of performance parameters for action research and post-singing; it was found that the mean scores for the parameters 'musicality', 'technique', 'correct use of breath', 'correct use of body', 'legato singing' and 'style interpretation' increased from 63.62 points to 75.3 points.[21] In our study, it was found that the mean score increased from 65.00 points to 79.58 points. It was therefore concluded that performance rates increased in a similar manner in both studies.

The autonomic nervous system (ANS) regulates certain bodily processes, such as blood pressure and breathing rate, which are controlled by centres in the spinal cord, brain stem and hypothalamus. The autonomic nervous system consists of sympathetic, parasympathetic and enteric divisions. The parasympathetic division is normally associated with the basal autonomic functions of heart rate and respiration. Rhythmic mobilisation of the joints activates the parasympathetic part of the ANS, resulting in both increased joint movement and relaxation of peripheral muscles.[11]

The singer's instrument is inside her body, and she produces sound with her whole body, not just her vocal chords. For this reason, singers should know their bodies well. In addition, since physical and mental tensions create tension in the joints, spine and muscles, they should act with an understanding of the importance and necessity of relaxation.[22]

The term "mobilisation" refers to low-velocity manual therapy techniques that involve continuous passive movement of joints and/or associated soft tissues.[23] Due to the physiological lordosis of the spine, the cervical and lumbar regions carry a greater load than the thoracic and sacral regions.[24] Cervical mobilisation is one of the most common techniques used to treat head and neck disorders.[25] In particular, mobilisation of the neck facilitates control of the respiratory muscles and thus more controlled voice management can be achieved. In this study, the video recordings of the students who underwent cervical mobilisation before and after the application were interpreted by two experts. Both experts reported that the students' vocal and respiratory control increased after the application, that they were more successful in performing legato, and that their postures were more accurate.

It has been shown that the electromyographic activity of the superficial neck flexors decreased and the function of the deep neck flexors increased after cervical mobilisation.[26] The source for the electromyographic activity is muscle afferent input, particularly from the muscle spindle.[27] The presence of many muscle spindles and mechanoreceptors that provide proprioception in the suboccipital region where the cervical vertebrae are located makes the cervical region important between the spinal segments.[28] As a result of the cervical mobilisation used in this study, it was found that the participants' attention level and postural stabilisation increased. An increase in musicality was also measured. Receptors in the cervical region not only connect to the visual and vestibular systems, but also to the sympathetic nervous system. Receptors involved in the cervico-colic reflex, cervico-ocular reflex and tonic neck reflex are important in regulating head, eye and postural stability. The cervico-colic reflex helps to maintain the position of the head in space, the cervico-ocular reflex helps the eye to see clearly during head movements by activating the extra-ocular muscles, and the tonic neck reflex helps to maintain postural stability.[29] The people in this study received a single session of cervical mobilisation. Although the average age of the participants in this

study was 24 years, the cervical range of motion limitations were severe. However, as a result of a single session of mobilisation, a significant increase in joint movement in all directions was measured. In addition, according to the expert reports analysing the vocal performance of the students participating in the study, it was reported that the students' attention increased, their postural control improved and their musicality increased. Therefore, it can be said that the single session of cervical mobilisation we used had a small benefit on acoustic performance.

Voice quality can be influenced by several postural aspects.[30] The position of the head relative to the torso can alter the diameter of the pharyngeal cavity.[31] The position of the head and cervical spine has been associated with certain types of voice.

Therefore, manoeuvres that facilitate these postures may improve sound emission. A study investigating the effect of spinal manipulative therapy on the singing voice of male individuals reported that no differences in the quality of the singing voice of asymptomatic male singers were observed after a single spinal manipulative intervention on either perceptual audio evaluation or acoustic evaluation.[20] A retrospective cohort study investigating the role of a specialised physiotherapy programme for patients with muscle tension dysphonia as an adjunct to standard voice therapy found improvement, but no significant results in favour of manual therapy.[32] According to literature reports, the superiority of this study is that we found a statistically significant improvement in cervical range of motion.

Our study has the limitations of being a small single centre study and the intervention time was relatively short. This study lacked the participation of male students because there was no vocal training for male students in this semester. In the current study group, the positive effect was obtained mainly in terms of interwiev reports. However, these reports are subjective measures based on expert opinion. Therefore, the use of objective measurement methods such as artificial intelligence and digitalised voice-body analysis, which can simultaneously measure the vacal effect of the cervical mobilisation technique, in future studies will strengthen the level of evidence.

CONCLUSION

This study found that a single session of cervical mobilisation had a positive effect on performance and cervical mobility. In light of these findings, it could be said that regular mobilisation of the cervical region would improve vocal performance in music students and professional musicians.

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ORIGINAL RESEARCH

The Effects of Early Mobilization on Pain and Quality of Recovery in Patients Undergoing Laparoscopic Cholecystectomy Surgery

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Abstract
Objective: The present study was conducted to investigate the effects of early mobilisation on pain and quality of recovery in patients undergoing laparoscopic cholecystectomy.
Material-Method: The method of this study included a pretest-posttest experimental design with a control group. This study was conducted in the inpatient general surgery department of a government hospital between August 2021 and May 2022. A total of ninety patients were included in the sample. Starting two hours after surgery, patients in the intervention group were mobilised at least 6 times within 24 hours. A "Patient Description Form", the "Visual Analogue Scale for Pain" and the "Quality of Recovery-40 Questionnaire" were used to collect data. The Visual Analog Scale for Pain was administered at 2 hours, 24 hours, and 15 days postoperatively, and the Quality of Recovery-40 Questionnaire was administered 2 hours before surgery and at 24 hours and 15 days postoperatively.
Results: The baseline and medical characteristics of the patients in the intervention and control groups were similar. No significant difference was found between the mean pain and recovery quality scores of patients in the two groups at 2 hours postoperatively. The mean pain severity scores of the intervention group at 24 hours and 15 days postoperatively were found to be significantly lower than those of the control group. It was found that the mean quality of recovery scores of the intervention group at 24 hours and 15 days postoperatively were also greater than those of the control group.
Conclusion: Early mobilisation was found to reduce the level of pain and improve the quality of recovery in laparoscopic cholecystectomy patients.
Keywords: Pain, Quality Of Recovery, Early Mobilisation, Laparoscopic Cholecystectomy

INTRODUCTION

As technology has advanced, so too have surgical techniques. One such development is laparoscopic surgery.[1] Laparoscopic cholecystectomy, first used in 1987 for patients with cholelithiasis, is a procedure in which the gallbladder is removed through minimal incisions in the abdomen.[2,3] Laparoscopic cholecystectomy has become one of the most commonly performed surgical procedures worldwide because it is safer for both the patient and the surgeon.[4]

Compared with open surgery, laparoscopic surgery has advantages such as less postoperative pain, faster recovery, earlier discharge and a more cosmetically pleasing result.[5-7] Although the intensity of postoperative pain in patients who undergo laparoscopic cholecystectomy is less than in those who undergo open cholecystectomy, this pain can still be distressing for patients.[5] Pain is an unpleasant emotional and sensory condition that can occur in any part of the body, whether or not it is due to tissue damage.[8] Pain causes prolonged hospitalisation or readmission in patients after laparoscopic cholecystectomy.[9]

In the post-operative period, pain management is very important to improve the quality of the patient's recovery and to prevent potential complications.[5] Adequate pain management is important to prevent deterioration of tissue perfusion, atelectasis and the likelihood of developing deep vein thrombosis.[10] Pain in the postoperative period can vary depending on the dose of anaesthetic given to the patient and the patient's mental and physiological state.[5] Therefore, "pharmacological" and "non-pharmacological" methods are used in pain management.[11,12] Non-pharmacological methods, which can be used alone or in combination with pharmacological agents, are simple and usually have no side effects and are also very important in pain management. An important

component of non-pharmacological pain management is early mobilisation.[10] Early mobilisation practices after all surgical procedures prevent many complications and improve the quality of the patient's recovery. Mobilising the patient after surgery increases venous return, regulates respiration and reduces the risk of abdominal dislocation by increasing the activity of the digestive system. In addition, early mobilisation reduces the patient's pain, shortens the length of hospital stay and reduces the cost of care.[13,14] Late mobilisation reduces alveolar ventilation and oxygenation, increases respiratory and cardiac workload, and increases the risk of deep vein thrombosis, which negatively affects the patient's quality of recovery.[15] In general, the concept of mobilisation encompasses many activities. Positioning in bed, sitting at the bedside and walking are different mobilisation activities. As with all surgical procedures, the quality of patient recovery after laparoscopic cholecystectomy is very important.[16] Improving the quality of the patient's recovery regulates the stress response that may occur in the patient and reduces morbidity and length of hospital stay.[17] To this end, enhanced recovery after surgery (ERAS) protocols have been developed. The early mobilisation included in these protocols improves the quality of the patient's recovery. Early mobilisation requires the patient to be out of bed for 2 hours on the first day and at least 6 hours a day until discharge.[16] Some studies in the literature have investigated the effect of early mobilisation on pain.[18-20] However, the literature review for this study did not identify any previous studies that investigated the effect of early mobilisation on pain and quality of recovery in patients undergoing laparoscopic cholecystectomy. This study is expected to add important evidence to the literature and practice in this area. Based on this idea, the aim of this study was to determine the effects of early mobilisation on pain and quality of recovery in patients undergoing laparoscopic cholecystectomy.

MATERIALS AND METHODS

Research design

This study was performed with an experimental research design including a pretest, a posttest, and a control group. The protocol of the study followed the TREND Statement principles, which were developed specifically to guide the standardized reporting of non-randomized controlled trials.

Population and sample of the research

The study population included patients who "underwent laparoscopic cholecystectomy" at the inpatient general surgery unit of a state hospital between August 2021 and May 2022. In this study, an a priori G*Power analysis was performed to determine the power of the included sample to represent the study population. Using a medium effect size (0.5), an alpha value of 5% and a theoretical power of 95%, the minimum sample size required for each group was calculated to be 45 patients. Ninety patients completed the study, "45 patients in the intervention group" and "45 patients in the control group". Patients were allocated to the two groups using simple random sampling by tossing a coin.[21] Individuals who met the inclusion criteria were included in the study, and those who tossed tails were allocated to the intervention group, and those who tossed heads were allocated to the control group.

Inclusion and exclusion criteria

Patients were included if they agreed to take part in the study, were over 18 years of age, had no cognitive or behavioural problems, had undergone laparoscopic cholecystectomy, and had an ASA I or II (American Society of Anesthesiologists) classification. Patients who underwent open cholecystectomy, those who did not want to take part in the study and those with a high ASA score were excluded from the study.

Data collection tools

A patient information form, mobilisation follow-up form, visual analogue scale for pain (VAS) and the Quality of Recovery 40 (QoR-40) questionnaire were used to collect data.

Patient information form

This data collection form was designed by the researchers to collect information on the socio-demographic and medical characteristics of the patients, including their age, sex, marital status, level of education, occupation, presence of chronic diseases, history of previous surgical intervention, smoking status, and presence of physical inactivity.

Mobilisation follow-up form: This is the chart prepared by the researchers to determine the time and duration of mobilisation applied to the patients after surgery.

Visual analog scale for pain (VAS)

The Visual Analogue Scale (VAS) for Pain, developed by Price et al, is used to rate the severity of the pain that the respondent is currently experiencing. This scale consists of a 10 cm ruler with 0 at one end and 10 at the other. An increase in the number marked by the patient is directly proportional to an increase in the pain they are currently experiencing.[22]

Quality of recovery 40 (QoR-40) questionnaire

The QoR-40 was developed by Myles et al. (2000). The validity and reliability study of the questionnaire in Turkey was conducted by Karaman et al. QoR-40 has five dimensions, namely physical comfort, emotional state, physical independence, patient support and pain. The questionnaire consists of 40 items scored on a five-point Likert scale. Each item has response options ranging from "none of the time 1' to 'all the time: 5' for positive statements and from 'none of the time 5' to 'all the time: 1' for negative statements. The lowest and highest possible total scores on the QoR-40 are 40 and 200. Higher total scores indicate better mood and physical condition of the patient. The Cronbach's alpha internal consistency coefficient of the scale is reported to be 0.936.[23] In this study this coefficient was 0.86.

Implementation

Intervention group

The patients' vital signs (blood pressure, heart rate, respiratory rate, oxygen saturation, blood glucose concentration) were measured in the 2nd hour after surgery. Patients whose vital signs were not negative were slowly seated in their beds. After the patients were allowed to sit in bed for 3 minutes, their blood pressure was measured again to check for orthostatic hypotension. The mobilisation of the 2 patients whose blood pressure was not within the normal range was postponed for 30 minutes and they were returned to bed. These patients then met the same mobilisation criteria as the patients in the intervention group. Those whose blood pressure was within normal limits were allowed to stand up slowly with the help of at least one 'relative'. After 10 minutes of mobilisation by walking in the corridor of the inpatient clinic, the patients were allowed to lie down again. The mobilisation times of the patients in this group were continued during the following mobilisation hours, with the time of mobilisation being increased with each step. During the first 24 hours of the postoperative period, patients were mobilised at least 6 times in total. This ensured that patients were mobilised for at least 2 hours in the first 24 hours after surgery.[16,24] Mobilisation times and durations were recorded. In the following days, patients and their relatives were informed that they should be active out of bed for at least 6 hours a day. The application times of the data collection instruments were determined based on a review of the relevant literature.[23,25,26] Preoperative QoR-40, VAS at 2 hours postoperatively, VAS at 24 hours postoperatively, and postoperative QoR-40 were applied face-to-face. On the 15th postoperative day, VAS and QoR-40 were administered for the last time by telephone interview.

Control group

Data from patients in the control group were obtained using the same measurement procedures as for the intervention group. Patients in the control group were mobilised at 6-8 hours post-operatively according to the clinic protocol, depending on their condition.

Statistical analysis

The statistical analyses of the collected data were conducted using the Statistical Package for the Social Sciences (version 22.0) software package. Frequencies, percentages, means, and standard deviations, Chi-squared test, paired-samples t-test, and Cronbach's Alpha internal consistency analysis were utilized to analyze the data. To compare the pretest-posttest mean scores of the patients in the groups, analysis of variance (ANOVA) and independent-samples t-tests were employed for repeated measurements. Skewness and kurtosis values were checked for testing the normality of the distribution of scale scores**.**

Ethical disclosure

Before starting the study, approval was obtained with the application made to the Non-Invasive Research Ethics Committee of a university. Written permissions were obtained from the Provincial Directorate of Health and the state hospital to carry out the study. Approval to use the scale in this study was obtained from the principal investigator. The verbal and written permission of the patients to be included in the study was obtained following their provision with the necessary explanations regarding the objective of the study and how it would be implemented.

RESULTS

It was determined that the differences between the intervention and control groups regarding their descriptive characteristics were not statistically significant, and the groups had similar characteristics ($p>0.05$, Table 1).

The mean 2nd-hour VAS scores of the intervention and control groups did not significantly differ compared to each other ($t=1.358$, $p=0.178$) (Table 2).

It was observed that the mean 2nd-hour VAS score of the intervention group was significantly higher than their mean 24th-hour and 15th-day VAS scores ($F=622.842$, $p=0.000$, respectively).

It was found that the mean 2nd-hour VAS score of the control group was significantly higher than their mean 24th-hour and 15th-day VAS scores ($F=499.076$, respectively, $p=0.000$) (Table 2).

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Table 1. Descriptive Characteristics

Descriptive Characteristics	Intervention Group (N=45)		Control Group (N=45)		Test and p-value
Age (Years)	46.91±14.30		48.33±12.97		T=0.494 P=0.623***
	S	**%**	**S**	**%**	
Gender					
Female	34	75.6	34	75.6	X^2=0.000
Male	11	24.4	11	24.4	P=1.000*
Education					
Illiterate	4	8.9	5	11.1	
Primary Education	21	46.7	20	44.4	X^2=0.236
High School	10	22.2	11	24.5	P=0.972**
University And Above	10	22.2	9	20.0	
Marital Status					
Married	41	91.1	44	97.8	X^2=1.906
Single	4	8.9	1	2.2	P=0.167*
Occupation					
Housewife	21	46.7	29	64.5	X^2=4.348
Officer	7	15.6	2	4.4	P=0.114**
Other	17	37.7	14	31.1	
Chronic Disease					
No	38	84.4	38	84.4	X^2=1.400
Hypertension	4	8.9	6	13.3	P=0.497**
Diabetes Mellitus	3	6.7	1	2.2	
Previous Surgical İntervention					
Yes	13	28.9	16	35.6	X^2=0.458
No	32	71.1	29	64.4	P=0.652*
Smoke					
Yes	18	40.0	15	33.3	X^2=0.431
No	27	60.0	30	66.7	p=0.512*
Lack of activity					
Yes	4	8.9	2	4.4	X^2=0.714
No	41	91.1	43	95.6	p=0.398*

Fisher's Exact Test **Pearson Chi-Squared Test ***Student's t-test

Table 2. Comparison of VAS Scores within and between Groups

	Intervention group		Control group		Test and p-value
	X±SD	**Test and p-value**	**X±SD**	**Test and p-value**	
2nd-hour VAS	6.16±0.97	F=622.842* p=0.000 1>2,3 2>3	5.89±0.88	F=499.076* p=0.000 1>2,3 2>3	t=1.358 p=0.178
24th-hour VAS	4.13±1.10		5.38±0.98		t=5.658** p=0.000
15th-day VAS	0.47±0.66		1.33±0.95		t=5.012** p=0.000

*Fisher's Exact Test **Pearson Chi-Squared Test ***Student's t-test

While no significant difference was found between the preoperative mean scores of the patients in the intervention and control groups in any dimensions of QoR-40, significant differences were determined between the mean 24th-hour and 15th-day scores of the intervention and control groups ($p<0.001$) (Table 3). It was determined that the mean 24th-hour QoR-40 score of the patients in the intervention group was

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significantly lower than their mean preoperative and 15th-day scores (F=50.965, p=0.000, respectively). It was found that the mean 24th-hour QoR-40 score of the patients in the control group was significantly lower than their mean preoperative and 15th-day (F=97.520, p=0.000, respectively). While there was no significant difference between the mean preoperative total QoR-40 scores of the patients in the intervention and control groups, the mean 24th-hour and 15th-day scores of the two groups were significantly different from each other (p<0.001) (Table 3).

Table 3. Intragroup and Intergroup Comparison of Patients' QoR-40 Questionnaire Mean Scores

		Intervention group		**Control group**		**Test and p-value**
		X±SD	**Test and p-value**	**X±SD**	**Test and p-value**	
Physical comfort	Preoperative	55.88±3.32	F=35.131* **p=0.000**	56.46±3.91	F=50.954* **p=0.000**	t=0.755** p=0.452
	24th-hour	55.64±3.47		52.86±3.14		t=3.974** **p=0.000**
	15th-day	59.84±0.42		59.31±0.84		t=3.773** **p=0.000**
Emotional state	Preoperative	39.71±2.97	F=53.939* **p=0.000 1<2 1<3 2<3**	40.06±2.50	F=51.377* **p=0.000 1<3 2<3**	t=0.613** p=0.541
	24th-hour	41.26±2.92		39.62±1.99		t=3.116** **p=0.002**
	15th-day	44.37±1.07		43.13±1.37		t=4.788** **p=0.000**
Physical independence,	Preoperative	23.28±1.90	F=71.007* **p=0.000 2<1 2<3**	23.35±1.76	F=173.386* **p=0.000 1>2 3>2**	t=0.173** p=0.863
	24th-hour	18.42±3.15		16.42±2.27		t=3.454** **p=0.001**
	15th-day	23.55±1.19		21.82±1.74		t=5.486** **p=0.000**
Patient support	Preoperative	32.02±1.68	F=32.019* **p=0.000 1<2 1<3**	31.62±1.33	F=12.686* **p=0.000 1<2 1<3**	t=1.248** p=0.216
	24th-hour	33.33±1.31		**32.62±1.26**		t=2.614** **p=0.011**
	15th-day	**33.24±1.15**		**32.26±1.26**		t=3.829** **p=0.000**
Pain	Preoperative	33.55±2.41	F=49.266* **p=0.000 2<1,3**	33.71±2.15	F=97.088* **p=0.000 2<1,3**	t=0.322** p=0.748
	24th-hour	30.88±1.69		29.46±1.61		t=4.071** **p=0.000**
	15th-day	34.60±0.49		33.93±0.75		t=4.972** **p=0.000**
Healing Quality Questionnaire Total	Preoperative	184.46±8.86	F=50.965* **p=0.000 2<1,3**	185.22±8.42	F=97.520* **p=0.000 2<1,3**	t=0.414** p=0.680
	24th-hour	179.55±10.79		171.00±7.71		t=4.325** **p=0.000**
	15th-day	195.62±3.26		190.46±4.22		t=6.479** **p=0.000**

*Fisher's Exact Test **Pearson Chi-Squared Test ***Student's t-test

DISCUSSION

Wounds, drains and pain, which are inevitable consequences of surgery, result in patients being confined to bed for short or long periods of time, preventing their mobilisation.[27] The prevention of mobilisation after abdominal surgery leads to various complications such as digestive problems, thromboembolic conditions and respiratory dysfunction. Early mobilisation, which is an important part of Enhanced Recovery After Surgery (ERAS), can minimise these complications.[28,29] Early postoperative mobilisation accelerates postoperative recovery by preventing the negative physiological

effects of immobility and surgical stress after abdominal surgery.[30] It has been reported that early mobilisation improves postoperative pulmonary function, aids pain management and has a positive effect on improving physical function, and patients can return home in a shorter time.[31-33] The positive outcomes of early mobilisation are considered to be beneficial to patients and have advantages in terms of efficient use of hospital resources and patient beds, as well as working conditions for hospital staff.[34] In light of this information, early mobilisation after abdominal surgery can be considered a key component of clinical management.[30] In this study, early mobilisation was found to reduce pain levels and improve the quality of recovery in laparoscopic cholecystectomy patients.

It was found that the differences between the patients enrolled in the intervention and control groups based on their baseline information were not significant, and therefore the groups were similar to each other (Table 1). It can be stated that this similarity between the groups is important for the efficacy and reliability of the study.

When the mean VAS scores of the intervention and control groups were evaluated at 2 hours after surgery, it was found that moderate pain was present in both groups, with the intensity of pain in the intervention group decreasing 24 hours after surgery, but moderate pain persisting in the control group. It was also found that the pain of patients in the intervention group had disappeared 15 days after surgery, whereas the intensity of pain remained, albeit at a low level, in patients in the control group (Table 2). In their study of the effects of early mobilisation on abdominal pain in laparoscopic cholecystectomy cases, Başar (2020) reported no significant difference between the pain scores of the intervention and control groups at 2 hours postoperatively.[35] In the same study, it was found that the pain scores of patients in the intervention group decreased significantly at 4 and 6 hours postoperatively. Studies have found that early mobilisation after surgery has a beneficial effect on patients' pain and reduces the severity of pain.[18,19,36,37] When the results of this study and those of the above studies are taken together, it is observed that early mobilisation has a beneficial effect in reducing pain. The results of previous studies in different patient groups support the results of this study. Early mobilisation is considered to be a nursing intervention that has a positive impact on patient outcomes in the postoperative period. Both reducing pain and achieving independence in patient activities may also be beneficial. Both reducing pain and achieving independence in activities for patients may also lead to a reduction in their sense of dependence on others as a result of their surgery.

In this study, based on the QoR-40 physical comfort dimension scores of the patients, it was found that the preoperative physical comfort levels of the patients in the intervention and control groups were similar. However, the patients in the intervention group had better physical comfort at 24 hours postoperatively and at 15 days postoperatively compared to the patients in the control group (Table 3). It was concluded that the physical comfort of patients who were mobilised early increased over time. It has been reported that early mobilisation has a positive effect on the comfort of patients undergoing abdominal surgery.[35,38] Comfort is defined in the dictionary of the Turkish Language Association (2017) as "ease that facilitates daily life".[39] The concept of comfort is a concept that is integrated with the nursing services provided to the patient to regain their health.[40] Good postoperative comfort of the patient has a positive effect on their healing process.[41] One of the important contributions of early mobilisation of postoperative patients is that the patient gains independence in the early period. It is thought that in this study, the mean QoR-40 physical comfort subscale score of the patients in the intervention group was higher because early mobilisation could affect the independence of the patient. Considering that one of the goals of care for patients undergoing surgery is to achieve and maintain patient comfort, it is reasonable to assume that this goal was achieved in this study by early mobilisation.

While no significant difference was found between the mean preoperative QoR-40 emotional state dimension scores of patients in the intervention and control groups, it was found that the emotional state scores of patients in the intervention group were higher at 24 hours and 15 days postoperatively compared to patients in the control group (Table 3). It has been reported that the practice of gradual early mobilisation in mechanically ventilated patients had a positive effect on their mood and reduced their anxiety.[42] Akkaya (2020) found that the duration of mobilisation was inversely related to anxiety and depression in patients undergoing open abdominal surgery.[43] Physical activity or exercise is an important part of a healthy lifestyle. While it allows the individual to distance themselves from negative moods such as depression, it increases positive moods such as excitement, joy, pride and confidence.[44] This study showing the positive

influence of early mobilisation on the emotional state of patients is supported by findings from studies with different samples. Considering that the surgical process produces different emotional states in patients, it is believed that early mobilisation will not only relieve the patient emotionally, but also improve physiological parameters that develop due to emotions.

The preoperative physical independence status of patients in the intervention and control groups in this study was found to be similar according to their QoR-40 physical independence dimension scores. Patients in the intervention group were found to have a better physical independence status at 24 hours and 15 days postoperatively (Table 3). The reason for this may be that patients should be mobilised early in the second hour after surgery and should be informed about their continued mobility at home. At the same time, the decrease in patients' pain levels after mobilisation may be a factor that allows for better physical independence. In a study of patients undergoing cardiac surgery, it was reported that patients who underwent early mobilisation had positive developments in their physical functioning.[45] It was found that early mobilisation of critically ill patients in the intensive care unit had positive outcomes, such as independent walking at discharge.[46] It was thought that as patients' physical independence increased in the period after their operations, they would feel more competent and less dependent on others.

The mean preoperative scores of the patient support dimension of QoR-40 for patients in the intervention and control groups in this study were similar, while the mean scores of patients in the intervention group were significantly higher at 24 hours and 15 days postoperatively (Table 3). Nurses should support the patient for mobilisation early in the postoperative period.[47] In the items of the patient support dimension of QoR-40, there is an option to receive support from nurses in the hospital. It is thought that patients in the intervention group felt more supported because nurses explained the procedures and interventions, clearly explained the benefits of early postoperative mobilisation to the patient, and provided a safe environment for the patient prior to mobilisation.

In this study, no significant difference was observed between the mean preoperative QoR-40 pain dimension scores of patients in the intervention and control groups, while the mean 24-hour and 15-day postoperative scores were higher in the intervention group (Table 3). Dehghani et al (2020) reported that the mean pain scores of patients decreased with the early mobilisation programme they applied in patients who underwent laparoscopic cholecystectomy.[20] Ni et al (2018) observed that the mean pain scores were lower in patients who were mobilised early after liver resection.18 In agreement with the results of other studies in the literature, it can be argued that early mobilisation after laparoscopic cholecystectomy has a positive effect on the reduction of pain and the quality of recovery. In the comparisons between groups in this study, the difference between the intervention and control groups in terms of mean preoperative total QoR-40 scores was not significant, but there was a significant difference between the groups at 24 hours and 15 days postoperatively. Lee et al (2011) found that the early nutrition and early mobilisation programme applied after colorectal surgery shortened the recovery time of patients.[48] A systematic review found that early mobilisation of patients in the first 24 hours after surgery had a positive effect on rapid recovery.[49] Zang et al (2020) found that early mobilisation and rehabilitation of patients in the intensive care unit improved the quality of recovery of patients.[50]

The ERAS protocol, which includes early mobilisation, reduces the risk of postoperative complications and ensures early recovery and discharge.[51] Nechay et al (2021) found that the ERAS protocol followed after laparoscopic cholecystectomy accelerated recovery and reduced the length of hospital stay in patients.[52]

Inactivity causes many complications in patients, including muscle weakness and atrophy. Early mobilisation reduces the possibility of developing various complications and ensures early recovery of the patients.[53] It can be seen that the results of previous studies conducted in different patient groups support the result of this study.

LIMITATIONS

This study had some limitations. The results of the study can only be generalised to patients undergoing laparoscopic cholecystectomy who meet the inclusion criteria. The fact that the data in the study were based on self-reports by the participants may also have been a limitation. Another limitation was the sample size and the fact that the study was conducted in a single hospital. The random allocation of patients to the groups and the statistical analyses performed by an expert statistician were the strengths of this study.

CONCLUSION

In conclusion, early mobilisation after laparoscopic cholecystectomy was found to be beneficial in reducing patients' pain and improving the quality of their recovery. It is recommended that patients undergoing surgery should be informed about the importance and timing of early mobilisation, that in-service training programmes on early

mobilisation should be organised for nurses working in surgical clinics, that these programmes should be repeated at regular intervals, and that the effects of early mobilisation should be studied in different samples.

It can be argued that early mobilisation in laparoscopic cholecystectomy is a non-pharmacological nursing intervention that reduces the level of pain and improves the quality of recovery in patients. Early mobilisation has a positive impact on postoperative patient outcomes.

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ORIGINAL RESEARCH

Work-Related Musculoskeletal Disorders in Apple Farmers in Türkiye: Prevalence and Risk Factors

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Abstract
Objective: The strenuous nature of apple growing can be the cause of a number of physical problems. This study was conducted to identify the prevalence of Work-Related Musculoskeletal Disorders (WRMSDs) and ergonomic risks among apple farmers in Türkiye.
Material-Method: Data on WRMSDs were obtained from the Nordic Musculoskeletal Questionnaire Extended Version (NMQ-E), while risk factors were collected using the Rapid Upper Limb Assessment (RULA). Prevalences were established by frequency analysis. The relationships between WRMSD of 9 body regions and age, weight, working hours (per day/per week), working experience and RULA score were analyzed by binomial logistic regression analysis.
Results: A total of 51 volunteers participated in the study including 42 males and 9 females. The knees (53.8%) were the most common WRMSDs reported over a lifetime, followed by the neck (46.2%), lower back (44.2%), and shoulders (38.5%). Participants were working in a medium (40.4%) and high (42.3%) risk posture according to the RULA assessment. Age, weight, working hours (per day/per week), work experience and RULA were associated with WRMSDs in one or more body regions ($p<0.05$).
Conclusion: WRMSDs were common among the apple farmers in Türkiye and the farmers were working in a high-risk position. The current findings highlight the need to address the high prevalence of WRMSD among apple farmers through appropriate screening and intervention.
Keywords: Work-Related Musculoskeletal Disorders, Rapid Upper Limb Assessment (RULA), Nordic Musculoskeletal Questionnaire Extended Version (NMQ-E), Ergonomic Risk Factors, Apple Farmers

INTRODUCTION

Work-related musculoskeletal disorders (WRMSDs) are injuries to muscles, nerves, ligaments, tendons, spinal cord or joints caused by hazardous situations such as prolonged awkward postures, exposure to trauma, repetitive movements, and psychosocial pressures during work tasks.[1] The International Labour Organization has shown that WRMSDs cause approximately 160 million work-related illnesses worldwide each year, thus making them an important global occupational health and socioeconomic problem.[2] WRMSDs are known to cause pain, fatigue, limitation of movement, loss of muscle strength, and stress as well as reduced quality of life, physical activity levels and work performance.[3,4]

The agricultural sector is a major risk factor for WRMSDs as it involves large numbers of workers worldwide and includes hazardous work activities.[5] Agricultural work also is different from other professions as it involves working in difficult conditions, both indoors and outdoors.[6] Their working conditions include psychological pressures as well as physical challenges such as heavy loads, poor posture, and exposure to vibration from agricultural implements and power tools. These risks make agricultural workers vulnerable to musculoskeletal disorders.[6,7]

Apple is a product that can adapt to different climates so, its cultivation is quite common throughout the world as well as in Türkiye.[8] According to the data provided by the Food and Agriculture Organization in 2015, Türkiye ranked 3rd in the world in apple production in 2012.[9] Pre-harvest, harvest and post-harvest activities of apple farmers include pruning, picking, packing, etc., and these activities may require prolonged and repetitive movements, heavy lifting, prolonged standing/sitting and working in

positions with the upper extremity above the head. Some studies on farmers in different countries have shown that farming can cause musculoskeletal disorders, pain and/or loss of work capacity.[5,6,10-12] For this reason, the risks and prevalence of WRMSDs due to working postures of apple farmers in Türkiye, which covers a wide area of apple growing, should be determined and this study was planned for this purpose.

MATERIALS AND METHODS

Participants

The cross-sectional study was conducted among apple farmers in Türkiye. Ethical approval was granted by the Ethics Committee of the University of Health Sciences (Approval number; 2023/188). An informed consent form was signed by the apple farmers before the physical examination.

Inclusion criteria were: age 18-65 years, apple farmer for at least 1 year, and volunteer for the study. Exclusion criteria were as follows: any history of musculoskeletal surgery in the last two years, chronic musculoskeletal diseases, and cognitive problems.

After recording demographic characteristics (age, body mass index (BMI), gender, work experience, weekly working hours, daily working hours, etc.), the individuals who met the inclusion criteria were assessed using the following assessment tools.

Measurement Tools

Work-related musculoskeletal disorders assessment

The Nordic Musculoskeletal Questionnaire Extended Version (NMQ-E) was used to assess the prevalence of WRMSDs in apple farmers. The NMQ-E covers nine body regions: neck, shoulder, upper back, elbow, wrist/hand, lower back, hip/thigh, knee, and ankle/foot and provides reliable information on the onset, prevalence and consequences of musculoskeletal disorders. For each domain, apple farmers completed questions on prevalence (lifetime, 12-month, 4-week and point prevalence), age at onset, lifetime effects (hospitalisation and activity impairment) and effects within the last 12 months (activity impairment, healthcare use, medication use and sickness absence).[13,14]

Risk factor assessment

The Rapid Upper Limbs Assessment (RULA) was used to evaluate risk factors in apple farmers during work. The RULA assessment divides all parts of the body into two groups: Group A includes the upper arms, forearms, and wrists, while Group B includes the neck, trunk, and legs. Repetitive movements or prolonged static positions during work on the relevant body part increase the risk score. Group-A and Group-B scores are combined to produce a final score on the RULA worksheet. Grand score is listed as follows: Score 1-2= posture is acceptable (Negligible); Score 3-4= further investigation is required, and changes may be needed (Low); Score 5-6= investigation and changes are required soon (Medium); Score 7= immediate investigation and changes are needed (High).[15]

The relationships between WRMSDs of 9 body regions and age, weight, working hours (in a day), working hours (in a week), work experience (in years), and RULA score were analysed.

Statistical analysis

Statistical Package for Social Science (SPSS) version 26.0 software was used to analyse. Descriptive statistics were used to quantify the prevalence and risk factors of WRMSDs. Quantitative data were characterized by mean and standard deviation (X±SD), and qualitative data were expressed as number/percentage (n/%). Binomial logistic regression analysis was used to identify factors associated with WRMSDs in each body region. Odds ratios (OR) and 95% confidence intervals (CIs) are used to present the results of the analysis. The level of statistical significance (p) was accepted as <0.05.

RESULTS

Initially 69 farmers participated in the study, but 18 farmers were illiterate or unable to complete the assessments for some reason and were therefore excluded. A total of 51 volunteers were included in the study, including 42 males and 9 females. The mean age of the farmers was 54.94 (range 18-80) years. Table 1 details the characteristics of the participants.

Of the nine body regions, the knee (53.8%) was the most commonly reported WRMSD over a lifetime, followed by the neck (46.2%), lower back (44.2%), and shoulder (38.5%). These body regions were also the most commonly reported WRMSDs in the last 12 months, last month and today. Table 2 summarizes the distribution of WRMSDs reported by farmers in different parts of body.

The results of the study showed that the majority of the participants worked in a medium (40.4%) and high (42.3%) risk postures according to the RULA assessment. The results of the RULA assessment of the apple farmers are shown in Table 3.

The results of the binomial logistic regression analysis examining the relationships between WRMSD of 9 body regions and age, weight, working hours (in a day), working hours (in a week), work experience (in years), and RULA Grand score are presented in Table 4.

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Table 1. The characteristics of the study population

Variables	**Min – Max**	**Mean (SD)**
Age (years)	18 – 80	54.94 (14.33)
Height (cm)	155 – 195	169.64 (9.18)
Weight (kg)	53 – 125	80.03 (16.82)
Body Mass Index (kg/m^2)	18.52 – 36.73	27.67 (4.57)
Working hours (in a day)	4 – 12	7.92 (0.91)
Working hours (in a week)	15 – 56	49.72 (11.98)
Working experience (in years)	1 – 50	13.45 (12.69)
	N	**%**
Smoking		
Yes	13	25.5
No	38	74.5
Education level		
Primary school	16	31.4
Middle school	9	17.6
High school	11	21.6
University	15	29.4

Min: Minimum; Max: Maximum; SD: Standard Deviation; cm: centimeter; kg: kilogram; m: meter; N: Participation number

Table 2. Summary of distribution of WRMSDs in different body parts on the basis of NMQ-E

Body region	**Lifetime**		**Last 12 months**		**Last Month**		**Today**	
	Frequency	(%)	Frequency	(%)	Frequency	(%)	Frequency	(%)
Neck	24	46.2	22	42.3	22	42.3	19	39.5
Shoulders	20	38.5	18	34.6	18	34.6	18	34.6
Upper back	12	23.1	12	23.1	11	21.2	11	21.2
Elbows	11	21.2	11	21.2	11	21.2	10	19.2
Wrists/hands	14	26.9	14	26.9	13	25	12	23.1
Lower back	23	44.2	22	42.3	21	40.4	21	40.4
Hips/Thighs	11	21.2	11	21.2	10	19.2	9	17.3
Knees	28	53.8	25	48.1	24	46.2	22	42.3
Ankles/feet	12	23.1	11	21.2	11	21.2	11	21.2

Table 3. Result of RULA final score

RULA Score	**Min**	**Max**	**Mean (SD)**
Group A	5	9	6.35 (1.26)
Group B	3	7	5.29 (1.52)
Grand Score	4	7	6.33 (0.93)
Risk Level		**N**	**%**
1-2	**Negligible**	4	7.8
3-4	**Low**	4	7.8
5-6	**Medium**	21	40.4
7	**High**	22	42.3

RULA: The Rapid Upper Limbs Assessment, Min: Minimum, Max: Maximum, SD: Standard deviation, Group A: includes the upper arms, forearms, and wrists, Group B: includes the neck, trunk, and legs, N: Participation number

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Table 4. Factors associated with lifetime prevalence of WRMSDs in the each body region: binomial logistic regression.

	Age			**Weight**			**Working hours (in a day)**			**Working hours (in a week)**			**Working experience (in years)**			**RULA Grand Score**		
WRMSDs	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Neck	0.94	0.86 – 1.03	0.20	**0.48**	**0.24 - 0.98**	**0.04***	0.99	0.95 – 1.03	0.74	0.84	0.67 – 1.03	0.84	0.97	0.89 – 1.04	0.45	0.06	0.00 – 1.54	0.09
Shoulders	**0.89**	**0.81 – 0.97**	**0.01***	1.05	0.99 – 1.12	0.09	0.51	0.19 – 1.38	0.18	1.03	0.96 – 1.10	0.36	0.95	0.90 – 1.01	0.17	**0.30**	**0.10 – 0.83**	**0.02***
Upper back	**0.79**	**0.66 - 0.94**	**0.00***	1.02	0.98 – 1.16	0.11	**0.17**	**0.03 – 0.83**	**0.02***	**1.09**	**1.00 – 1.20**	**0.04***	0.93	0.87 – 1.01	0.08	0.26	0.06 – 1.09	0.06
Elbows	0.99	0.92 – 1.06	0.88	1.00	0.95 – 1.05	0.91	1.07	0.43 – 2.65	0.88	1.04	0.97 – 1.12	0.22	**0.93**	**0.87 – 0.99**	**0.04***	0.95	0.38 – 2.35	0.91
Wrists/hands	1.01	0.96 – 1.07	0.54	1.00	0.96 – 1.04	0.91	1.31	0.53 – 3.24	0.55	1.01	0.94 - 1.08	0.71	0.96	0.91 – 1.02	0.22	1.43	0.68 – 3.02	0.34
Lower back	0.98	0.93 – 1.03	0.57	0.99	0.96 – 1.03	0.95	0.51	0.18 – 1.38	0.18	1.06	1.00 - 1.13	0.05	0.96	0.91 – 1.02	0.23	0.78	0.38 – 1.62	0.51
Hips/Thighs	0.96	0.89 – 1.03	0.34	**0.93**	**0.88 – 0.99**	**0.03***	2.46	0.55 – 10.87	0.23	1.00	0.91 - 1.11	0.87	0.95	0.88 – 1.02	0.18	1.17	0.45 – 3.03	0.73
Knees	0.95	0.90 – 1.00	0.06	0.99	0.95 – 1.03	0.83	0.00	0.00 – 0.00	0.99	0.99	0.92 – 1.06	0.92	1.00	0.95 – 1.06	0.82	0.74	0.36 – 1.51	0.41
Ankles/feet	**0.90**	**0.82 – 0.99**	**0.03***	1.02	0.96 – 1.07	0.49	0.84	0.26 – 2.66	0.77	1.00	0.94 – 1.07	0.88	1.03	0.96 – 1.10	0.38	0.98	0.45 – 2.16	0.97

RULA: The Rapid Upper Limbs Assessment; OR: Odds Ratio; p: Significance Value; 95%CI:Confidence Interval; *: indicates an association

DISCUSSION

The strenuous nature of apple growing, both before and after harvest, can cause a range of physical and mental problems.[16,17] This study was conducted to identify the prevalence of WRMSDs and ergonomic risks among apple farmers in Türkiye. Literature on the assessment of WRMSDs and ergonomic conditions in this population is limited.[11,18-21] To help fill this gap, this study is an attempt to evaluate the WRMSDs and risk factors among apple farmers in Türkiye. The results of the current study showed that musculoskeletal disorders are common in this specific occupational group, that individuals mostly work in high-risk postures, and that musculoskeletal problems in different body regions of individuals increase with age and work experience.

The prevalence of WRMSD symptoms in the study population was very high. The results of the current study showed that 80.4% of the people in the study had experienced a musculoskeletal problem in at least one part of their body during their lifetime. WRMSDs were most common in the knees and least common in the elbows and hips/thighs. The knees were followed by the neck, lower back and shoulders. The current findings show that the results of the present study are consistent with the literature and that apple picking causes problems such as increased pain, discomfort and aching in all parts of the body, particularly in the areas mentioned. In a study of apple growers in Iran, the findings were similar to our study and the most common WRMSDs in Iranian apple growers were observed in the lumbar, knee and neck regions.[16] In another study, the body regions most affected by WRMSDs in American apple growers were the shoulder and back.[11] In a study investigating musculoskeletal symptoms in Japanese female farmers during apple bagging, the shoulder, neck, leg and lower back were the regions with the most stiffness and pain symptoms.[19] Pruning, which is one of the pre-harvest activities in apple growing, is particularly common in positions where the shoulders are above the head. In addition, when picking apples, workers tend to work with their heads up and arms outstretched, which means that the muscles around the shoulders are used excessively and they remain in a static position for long periods of time, putting muscles and tendons at risk. Farmers are also exposed to constant bending and straightening and excessive strain on the lower back when loading and transporting apples in crates. Much of this work is done standing, bending or lying down. This puts strain on the knees. These working conditions may explain the prevalence of musculoskeletal disorders, particularly in the affected parts of the body.

Similar to WRMSDs, work-related risk factors were quite high in this study population. It was determined that 82.7% of the individuals included in the study worked in high-risk positions and their weekly working hours were significantly high despite working in this awkward posture. The fact that these farmers spent an average of about 50 hours per week

in a very awkward posture in agricultural activities would lead to occupational injuries. Very little research has focused on identifying awkward activities/postures of apple growers before or after harvest, and the results in different countries have been similar to those of apple farmers in Türkiye. In a study of working farmers during the traditional apple harvest, participants were assessed using the RULA method similar to our study and documented that pickers spent approximately 64% of their working time in awkward postures.[20] A different study conducted with apple growers from New York and Pennsylvania revealed that every picker was consistently observed reaching above elbow height during the apple picking process.[11] Another study reported that individuals' working posture of elevating the arm more than 90° accounted for 40% of the time to bag apples.[19] The current study also found similar results to the literature and reported that apple growers in Türkiye also worked in high-risk positions that could lead to muscle, tendon and ligament injuries, such as repetitive upper extremity activities with arms extended overhead, mostly standing, or bending and straightening activities. It is also known that working overhead requires not only raising the arms, but also stretching the head.[19] Therefore, working in this awkward posture may explain the musculoskeletal symptoms experienced in many parts of the body, particularly the knees, shoulders, lower back, and neck.

Despite the high prevalence of the risk scores obtained by the RULA method and the WRMSDs obtained by the Nordic assessment, no correlation could be detected, except for shoulders. This can be explained by the wide age range (18-80) of the people included in this study. In future studies with a more homogeneous study population of a similar age, this analysis can be repeated. According to the results of the logistic regression, there was an association between age and musculoskeletal complaints in the shoulders, upper back and ankles/feet; between weight and musculoskeletal complaints in the neck and hips/thighs; between working hours and musculoskeletal complaints in the upper back; between work experience and musculoskeletal complaints in the elbows; and between RULA score and musculoskeletal complaints in the shoulders These findings were consistent with various previous studies of poor working postures among farmers for various agricultural activities.[22-26] This suggests that farmers' working hours and posture need to be adjusted. In addition, farmers who appear to be at risk of becoming overweight should be made aware.

This study attempted to present the demographic variables, WRMSDs and risk factors of apple growers in Türkiye. However, there were a number of limitations. Firstly, the study population consisted of a small number of people as farmers were excluded due to illiteracy or inability to complete the assessments for any reason. Another limitation was the lack of similarity in variables such as age, working hours or work experience in this population. This allows for a more homogeneous study population with larger sample sizes for better and more comprehensive results.

CONCLUSION

In conclusion, WRMSDs were common among the apple farmers in Türkiye, and the farmers were working in a high-risk position. The current findings highlight the need to address the high prevalence of WRMSD among apple farmers through appropriate screening and intervention.

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Conflict of Interest: There is no potential conflict of interest relevant to this article.

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REVIEW

Does Reflexology Reduce Labor Pain? *A Systematic Review*

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Abstract
Objective: In this systematic review, we aim to evaluate the effectiveness of foot reflexology in reducing labor pain intensity.
Material-Method: The study was done in the second half of 2019. PubMed (MEDLINE), CINAHL (EBSCO), Scopus, Science Citation Index, Science Direct, ULAKBIM (Turkish National Databases) databases were searched using terms and keywords including 'labor pain' 'vaginal delivery' 'normal delivery' 'pregnancy and delivery' 'reflexology' 'foot massage' 'pain and reflexology' in three languages. 3292 articles (English, Turkish and Persian languages) reached by using keywords and scanning electronic databases (between 2009 and 2019). Nine descriptive cross-sectional studies were evaluated that involving provide only quantitative results and descriptive designs quantitative elements of mixed (qualitative and quantitative) method studies.
Results: Out of the 3292 articles found in the databases, only 9 met the inclusion criteria and were included in the study. Studies have shown that foot reflexology during labor reduces the severity of labor pain.
Conclusion: Performing foot reflexology can be an effective and low-cost method of pain relief, reducing both pain and the duration of labor. It is recommended that further studies with sufficient statistical power be conducted in this field.
Keywords: Labor Pain, Foot Massage, Complementary Therapy, Reflexology

INTRODUCTION

Labor pain is considered one of the most intense pains in the world, equivalent to the pain experienced during childbirth. Over the years, various methods have been developed to alleviate this pain. During delivery, some women experience pain which can lead to panic and anxiety.[1] Pain also causes many physiological changes. Accordingly, the sympathetic nervous system is motivated to enhance catecholamine discharge, which in turn can lead to increased hormone levels, including epinephrine.[2] These will aggravate the pain and prolong the stages of labor. All these processes can lead to deterioration of the psychological state of the mother. It can also negatively affect mother-infant bonding.[3] As a result, it makes an unpleasant experience of childbirth. Additionally, the fear of pain of delivery leads to irregular increase in the use of the cesarean method.[4] Managing labor pain is a significant health challenge, as previously discussed. Pharmacological and non-pharmacological interventions should be used to relieve labor pain because pain can affect the physiological and psychological situation.[5] During pregnancy, the use of anaesthetic drugs is less preferred due to their passage via the placenta. Fear of medication side-effects and the tendency for symptom relief are possible reasons for the increasing usage of non-pharmacological pain relief by patients.[6]

There are three fundamental ways to manage labor pain: Maintaining fetal homeostasis, safety and simplicity. Non-pharmacological methods can be used to reduce labor pain.[7] There are several non-pharmacological methods to lessen labor pain, including massage, reflexology, touch-therapy, water-therapy, transcutaneous nerve stimulation, aromatherapy, and acupressure.[8] Reflexology has been a helpful method of nursing care for several hundred years in China, Egypt, and India.[9] Foot massage pictures found in Egyptian tombs offer that reflexology has been used as a therapy for almost 5000 years.[10]

Eunice Ingham[11], the founder of the reflexology known as Zone Therapy, believed that all organs and endocrine organs are linked with reflexes in the legs, hands, and ears.[12] The evidences have shown that reflexology is useful in many conditions such as prenatal-postnatal pain, chronic obstructive pulmonary disease, and migraine.[13] Therapeutic

effects have also been claimed such as strengthening the immune system, improving sleep quality and wound healing.[14] The Reflexology Association of Canada[15] defines reflexology as "*a natural healing art based on the principle that there are reflexes in the feet, hands and ears and their referral areas within the related zone, which correspond to every part, gland, and organ of the body*".

Reflexology is based on a system of reflex zones on the feet.[16] The pressure which is applying to reflex zones, blocks calcium crystals, and uric acid. In this way, opens blocked nerve pathways, and improve blood flow in the entire body. This process is called detoxification.[2] With this method, the body's self-healing process is activated, body's physiological relaxation is provided, the body's blood flow is improved, homeostasis is achieved, and tension is reduced, and physiological and psychological health and wellbeing are restituted and maintained.[17]

The mechanism of action for reflexology is not yet known. The most popular hypotheses are the gate control theory of pain, neural impulse theory, which increase the secretion of endorphins and enkephalins. Reflexology is assist relief from pain, boost lymphatic and blood flow and thereby increase toxin excretion from the body.[18] Another theory about foot reflexology is that stress is responsible for 75% of health problems in humans. Nerves in each foot can be stimulated by foot massage, which can reduce stress and promote relaxation, leading to a sense of body equilibrium.[19]

Reflexology is used to treat various physiological conditions during pregnancy, childbirth ,and puerperium like nausea and vomiting, constipation, headache, back pain, carpal tunnel syndrome, breastfeeding, edema, fatigue, premenstrual symptoms, increasing quality of life, providing quality sleep in the postpartum period and menopausal, reducing labor pain, shortening the first, second and third phases of labor, *muscle relaxation in patients with multiple sclerosis reduction in systolic blood pressure and the* reduction of cortisol and anxiety.[10,20-26] The studies which have been conducted on the effect of reflexology on outcomes of labor are limited. Therefore, the current study aims to assess the use of foot reflexology in reducing labor pain.

MATERIALS AND METHODS

Materials

The purpose of this systematic review is to collect and to synthesize the best evidence of the impact of reflexology on labor pain. Specific research question: Does reflexology reduce labor pain?

The study was designed according to '*the Guidance on Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA, Annex)*' to systematically review quantitative studies of pain perception in pregnant women who underwent reflexology before and during labor. The study was conducted as a cross-sectional descriptive study.

Methods

As the first step the conducted study done in the second half of 2019 PubMed (MEDLINE), CINAHL (EBSCO), Scopus, Science Citation Index, Science Direct, ULAKBIM (Turkish National Databases) databases were searched using terms and keywords. Gray literature was not included in the study. In the second step of the study, each of the researchers initially focused on the abstract sections of the identified literature. Preliminary evaluation was performed according to the exclusion criteria of the study. In the third step, we studied the full texts of the identified research papers and evaluated those that met the inclusion criteria. Afterwards, the final evaluation was made by comparing the findings of the researchers the decision was made on which articles should be evaluated.

Inclusion and exclusion criteria will be added with justifications. All clinical studies of reflexology for labor pain were included. We excluded uncontrolled trials, case studies, case series, qualitative studies, review articles, systematic reviews, out of area articles, trails with a different alternative method and recurring articles. Therefore, this review includes descriptive cross-sectional studies that provide only quantitative results and descriptive designs involving quantitative elements of mixed (qualitative and quantitative) method studies. Between 2009 and 2019, we included studies published in English, Turkish and Persian (languages in which authors are fluent enough for screening).

The search results are summarized in the PRISMA flow chart. 3292 articles reached by using keywords and scanning electronic databases. The articles were primarily evaluated in terms of title, abstract and full text. A preliminary assessment was made according to the inclusion and exclusion criteria. Preliminary evaluation was carried out separately by each researcher and consensus was reached on the articles to be included in the research.

Statistical analysis

Between January 02 and June 1, 2019, Istanbul University - Cerrahpaşa databases were searched by adding criteria determined by using a collective search link. From 3296 articles, 8 review articles and

2846 articles which had nothing to do with labor pain were excluded from evaluation (Figure 1.)
9 articles included in the research were evaluated in terms of the first author, year, study design, sample size, and participants, method, using tools, primary outcomes, and complications manually. The second author also evaluated 9 articles, taking the same parameters into account. The authors reached a consensus that they compared both evaluations.

RESULTS AND DISCUSSION

A review of the articles on the study shows that they were all clinical trials. Two articles were excluded from the study due to their semi-experimental method.[27,28] In six studies, '*Visual Analog Scale (VAS)'*, in one study '*Numerical Pain Rating Scale (NPRS)*' and in two other studies, '*the McGill Pain Questionnaire'* was used to measure severity of labor pain.[15,25,29-35] Six articles were published in English and three in Persian (Table 1).
Although there are no articles published in Turkish, a doctoral dissertation was found among the thesis studies defined as gray literature but was not taken into consideration because it did not meet the inclusion criteria. In the investigated studies, most of the participants were housewives (59-98%) and in terms of literacy, diploma or high school level (53-97%). A randomized clinical trial with two / three groups method was used in all of the articles included in the study and the sample groups consisted of pregnant women (Table 1).

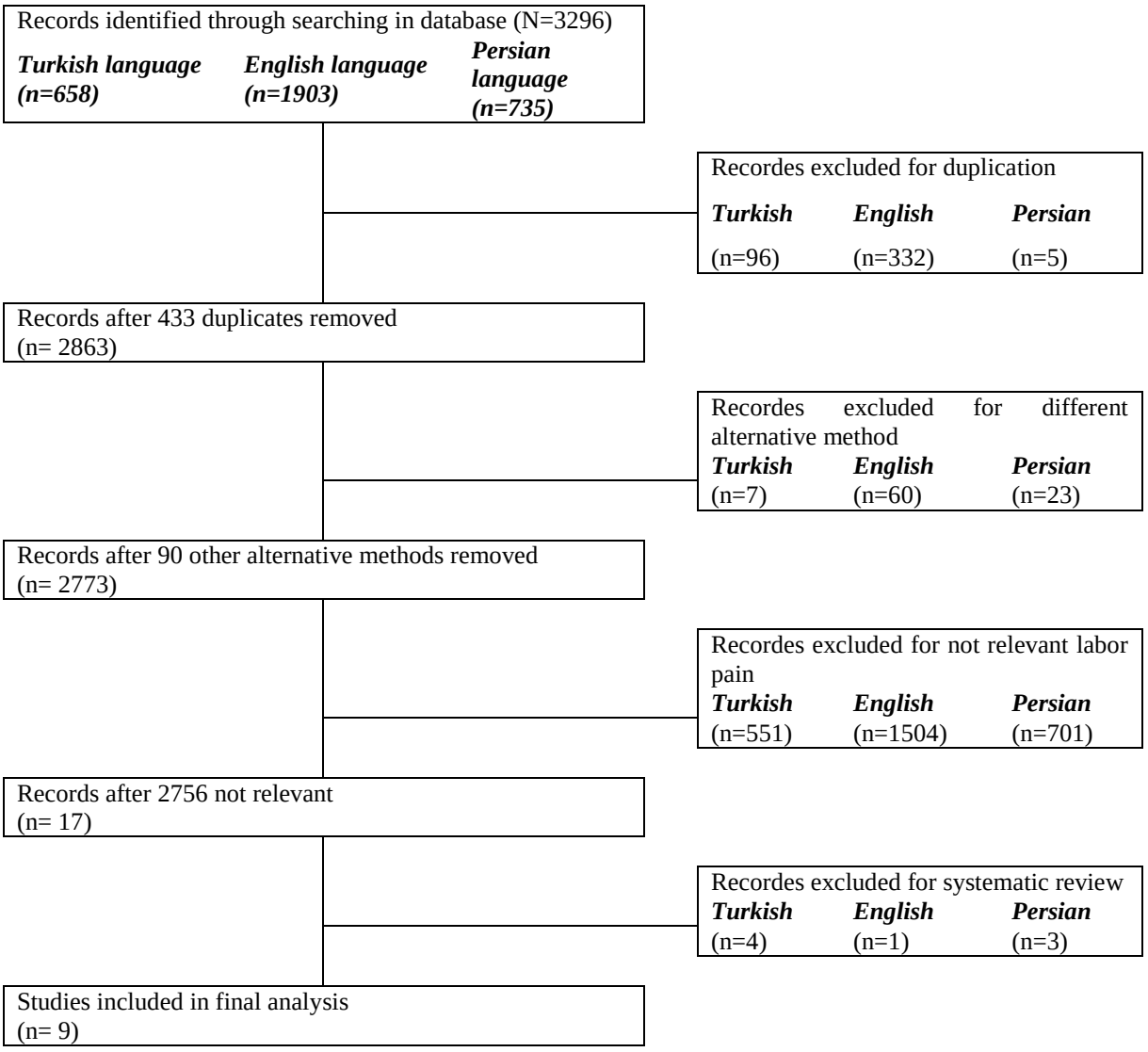

Figure 1. Search strategy

Table 1. Features of articles entered into the study

Author (year) (Language)	Study approach	Sample size and Participants	Method	Using tool	Primary outcomes	Complications
Moghimi-Hanjani S, Mehdizadeh-Tourzani Z, Shoghi M 2014[25] English	A randomized clinical trial with two groups	80 pregnant women attending Alborz and Bahonar hospitals of Karaj (Iran) Primigravida singleton pregnancies cephalic presentation being in the active phase of labor (dilatation 3-4 cm)	40 participants in the intervention group received 40 minutes of reflexology and 40 participants in the control group received routine cares + massage in other parts of the foot. Evaluating labor pain intensity, duration of labor, anxiety, the frequency distribution of natural delivery and Apgar scores	1.McGill Questionnaire for Pain Rating Index (PRI) 2.Spielberger State-Trait Anxiety Inventory	The mean pain score in half, one and two hours after reflexology significantly decreased. ($p<0.001$)	Not mentioned
Dolatian M 2011[30] English	A randomized clinical trial with three groups	120 pregnant women attending Shahid Akbarabadi Hospital of Tehran (Iran) Primigravida singleton pregnancies 18-35 years old, gestational age between 37-42 weeks	The first group received 40 minutes foot reflexology in 4-5 cm cervical dilatation. The second group received emotional support and the third group received only routine care Evaluating severity of pain and duration of labor	1.visual analog scale (pain ruler 0 to 10 cm). 2.Digital Clock	In cervical dilation 4-5 cm, the mean pain intensity is 4.5±1.06, 6.25±0.84 and 7.23±0.83 (reflexology group, support group and routine care group respectively) In the reflexology group the pain intensity was considerably lower in 6-7 cm and 8-10 cm compared to the other two groups ($p<0.001$).	Maternal or fetal complications were not observed.
Valiani M 2010[29] English	A randomized clinical trial with two groups	88 pregnant women attending hospitals of Isfahan (Iran) Primiparous mothers, Singleton pregnancies originality Iranian-born, 18-35 years old, Gestational age between 37-41 weeks, dilatation 3-5 cm, Cephalic presentation	44 people in the intervention group received 60 minutes foot reflexology once in the active phase of labor and again in 9-10 cm just on specific points 44 people received routine care. Evaluating Pain intensity, duration of labor and rate of hemorrhage	1.Short-Form of Mcgill Questionnaire 2.An Analog Clock 3.Counting The Number of Pads	Mean pain intensity in both scales was varying significantly after the intervention ($p< 0.001$).	Maternal or fetal complications were not observed.
ElFattah A, Metwaly S, Khedr N 2015[15] English	A randomized clinical trial with two groups	120 pregnant women attending to Ain Shams University Maternity Hospital (Egypt) Primiparous women the age range of 20- 35, gestational age of 37 to 42 weeks Normal pregnancies Cervical dilation from 4cm	40 women in the active phase of labor in the experimental group received 40 minutes foot reflexology 40 women in the control group received routine care. Evaluating Pain intensity, duration of labor and labor outcomes	1.Structured Interviewing Questionnaire 2.Women Assessment Sheet (Partograph) 3.Numerical Pain Rating Scale (NPRS): 0 (no pain) to 10 (worst pain) 4.Satisfaction Rating Scale Grading Score	After Intervention in 6-8 cm of dilatation Mean labor pain was 3.5± 0.8 vs 4.7 ± 0.8 in the control group ($p<0.05$) that illustrates a meaningful decrease in pain intensity after performing reflexology.	Maternal or fetal complications were not observed.

				(Highly Satisfied 15-20,Satisfied 7-14, Unsatisfied 0-6).		
Mirzaei F, Kaviani M 2009[31] Persian	A clinical trial with simple sampling with two groups	70 pregnant women attending Afzalipour Hospital in Kerman (Iran) Primiparous mothers gestational age >37 cervical dilatation 3-4 cm mean age range 25 ±3.6	39 women for experimental group received 20-minute Effleurage in just uterus points in the active phase of labor 31 women in the control group received routine care. Evaluating Pain intensity	Visual Analog Scale	In comparison with the control group (7.43± 1.3), Reflexology caused a significant decrease in pain intensity in the experimental group (5.38± 1.4) (p<0.001)	Not mentioned
Jenabi E, Hajiloo Mohajeran M, Torkamani M 2011[32] Persian	A clinical trial with two groups	80 pregnant women attending to Hamedan Social Security Hospital (Iran) Primiparous mothers Term pregnancy singleton pregnant women cephalic presentation cervical dilatation 3-4 cm	35 women for intervention group received 30-minute massage on reflex points between Heels and ankles in the first stage of labor 35 women in the control group received 30-minute massage in ankle muscles Evaluating Pain intensity	Visual Analog Scale	In the intervention group, a significant reduction in pain intensity has seen. (p = 0.001) However, there was no significant relationship between uterine reflex points massage and delivery duration. (p=0.59)	Not mentioned
Kamjoo A 2018[33] English	A randomized clinical trial with two groups	240 pregnant women attending Shariati hospital of Bandar Abbas (Iran) 18 to 35 years, Iranian nationality, 37th to 42nd week of pregnancy, cephalic presentation, having no history of infertility and caesarian indications, their pregnancy being intended, applying no other anesthetic or painkilling method during delivery	120 women for intervention group received 20-minute massage on reflex points between Heels and ankles in the first stage of labor 120 women in the control group received 20-minute massage in a spot other than the uterine spot. Evaluating Pain intensity	Visual Analog Scale	significant difference was found between the intensity of pain in the 5-7 and 8-10 cm dilatations of the two groups (p=0.01). The length of labor in the active phase was found to be shorter in the reflexology group (p<0.001).	Not mentioned
Hajighasemali S 2015[34] Persian	A clinical trial with three groups	92 pregnant women attending Shahid Akbar Abadi Hospital in Tehran First or second pregnancy, Iranian nationality, 18 to 35 years, 37th to 42nd week of pregnancy, singleton pregnant women, cephalic presentation, having no history of infertility and caesarian indications, being in the active phase of labor, non-rupture amniotice sac over 12 hours, loe risk pregnancy.	28 women in SP6 acupressure group received 60 minute pressure four fingers above the apex of the medial ankle and posterior part of the tibia bone, 30 women for reflexology group received 20-minute massage on solar plexus and uterin point, 34 women in the control group received routine care. Evaluating Pain intensity	Visual Analog Scale	The score of the intensity of pain did not significantly increase after the intervention. however, in the routine care group, the intensity of pain had increased (p=0.001).	Not mentioned
Abdulziz K 2017[35] English	A randomized clinical trial with two groups	40 pregnant women attending El Sahel Teaching Hospital Inclusion criteria: Primiparous women,	20 women in the experimental group received 20 minutes foot reflexology when cervix is at 3-5 cm dilatation,	Visual Analog Scale	1.There was a significant difference in pain severity in the reflexology	Not mentioned

	the age range of 20-35, gestational age of 37 to 41 weeks. Exclusion criteria: Multiparous women**,** twins**,** Infectious disease and fever**,** psychological disorders, epilepsy or seizures, Poly-hydramnios or oligohydramnios, history of any problem during this labor (placenta previa, abortion risk), Fetal distress, Hemorrhage **,** Incidence of any non-diagnosed dystocia.	20 women in the control group received routine care. Evaluating Pain intensity and Apgar score	team before and after the operation ($p< 0.001$). 2.There were significant differences in Apgar score at first and fifth minute after birth between intervention groups (8.65 and 9.8) and control (7.6 and 9.15) with $p<0.001$.

In all studies, it was stated that reflexology was applied in the active phase of labor (Table 1). According to the findings of this study, the duration and freq In all studies, it was stated that reflexology was applied in the active phase of labor (Table 1). According to the findings of this study, the duration and frequency of reflexology applications vary during these periods. It was determined that a minimum of 20 minutes and a maximum of 60 minutes were applied (Table 2). In all studies, reflexology was applied only once to the experimental group (Table 2). When the studies were examined in terms of body parts that were applied reflexology, it was determined that massage was mostly applied to the uterine reflex point.

uency of reflexology applications vary during these periods. It was determined that a minimum of 20 minutes and a maximum of 60 minutes were applied (Table 2). In all studies, reflexology was applied only once to the experimental group (Table 2). When the studies were examined in terms of body parts that were applied reflexology, it was determined that massage was mostly applied to the uterine reflex point.

According to our findings, it was determined that the Visual Analog Scale was the most widely used measurement instrument for assessing t he effect of reflexology on pain perception and the second place was '*the McGill Questionnaire for the Pain Rating Index (PRI)*'. It was determined that the Spielberger State-Trait Anxiety Inventory was used for the factors affecting pain perception. By the results of the studies which are included in this study, it was realized that reflexology significantly reduced pain score and increased cervical dilatation. Only one study reported that massaging the uterine point did not affect the delivery process

The findings of the study were consistent with the measured outcomes presented in Table 1. A total of two outcomes were evaluated in the reviewed studies, and the effect size and power analysis was not calculated in any of the studies. Nine articles showed positive results on foot reflexology for the level of pain, duration, mother satisfaction uterine contractions, maternal complications and Apgar scores. None of the studies mention adverse events.

Table 2. Specifications of reflexology type in articles entered into the study

Researchers	Reflexology points	Duration	The material used during massage	Times of application
Moghimi-Hanjani S, Mehdizadeh-Tourzani Z, Shoghi M[25]	Pituitary gland, Solar plexus and uterine point	40 minutes (20 minutes for each foot)	Sunflower oil	Not mentioned
Dolatian M[30]	Pituitary gland, Solar plexus, Lumbar, and sacral spine and Genital area	40 minutes (20 minutes for each foot)	Not mentioned	Once at 4-5 cm cervical dilatation
Valiani M[29]	Solar plexus, Areas related to the digestive viscera, Pelvic area, Pituitary, Sinuses, upper and lower extremities, Spinal cord, Lungs, Shallow chest area, The sides on the feet, Ovaries, Uterus and fallopian tubes; and the specific reflexology including the areas related to labor pain such as liver, spleen, kidney, pituitary, solar plexus and uterus.''	60 minutes (30 minutes for each foot)	Not mentioned	Once at 3-5 cm cervical dilatation
ElFattah A, Metwaly S, Khedr N[15]	Solar plexus, the area related to the digestive viscera, pelvic area, pituitary, sinuses, upper and lower extremities, spinal cord, lungs, the shallow chest area, the sides on the feet, ovaries, uterus and fallopian tubes; and the specific reflexology including the areas related to labor pain	40 minutes (20 minutes for each foot)	Not mentioned	Reflexology was conducted during the first stage of cervical dilatation (3-5 cm, 6-8 cm, 9-10 cm) and again during the second

	such as liver, spleen kidney, pituitary, solar plexus and uterus.''			stage of labor, with a concentration of at least five minutes on specific points
Mirzaei F, Kaviani M[31]	Uterine point (the region between the inner ankle and sole)	20 minutes (10 minutes for each foot)	Not mentioned	Once at 3-4 cm cervical dilatation
Jenabi E, Hajiloo Mohajeran M, Torkamani M[32]	Uterine point (the region between the inner ankle and sole)	30 minutes (15 minutes for each foot)	Not mentioned	Once at 4-5 cm cervical dilatation
Kamjoo A[33]	Uterine spot (a curving area between the ankle and the heel)	20 minutes (10 minutes for each foot)	Not mentioned	Once contractions began, the massage would also begin, and once the contractions were over, the message was over too
Hajighasemali S[34]	SP6 acupressure point (four fingers above the apex of the medial ankle and posterior part of the tibia bone), reflexology on solar plexus and uterin point between the ankle and the heel	60 minute for SP6 point and 20 minute for solar plexus and uterin point.	Not mentioned	Every two minutes without paying attention to Uterine contractions
Abdulziz K[35]	Reflexology on pituitary gland, Solar plexus, lumbar and sacral spine and genital points and also ovaries, uterine, pelvic region, fallopian tubes and sciatica points.	40 minutes (20 minutes for each foot)	Not mentioned	Once at 3-5 cm cervical dilatation

DISCUSSION

This study evaluates the effects of reflexology on the relief of labor pain in pregnant women. Touch therapy has always been a part of care and now, reflexology has become another part of it.[36] According to reflexology, which is defined as an old-fashioned holistic healing technique, all organs and glands are associated with reflex points in the feet, hands, and ears.[37] Studies have shown that reflexology is an effective method, particularly as a support in pain control treatment.[38]

It has been used to treat a variety of diseases such as migraine headaches, respiratory problems, pain and stress reduction, anxiety, hypertension and insomnia, reducing low back pain, reducing stress while working, increasing pain tolerance, promoting homeostasis, cancer pain and side effects of treatment, menopausal symptoms, dysmenorrhea, postpartum period discomfort and improving lactation, reduce nausea, vomiting, back pain, headache, help lactation and delivery.[39-44]

There are some mechanisms to explain why reflexology might reduce labor pain. Although the exact mechanism of action for reflexology has not been established yet, the first mechanism is gate control theory. Reflexology makes systematic and local physiological changes, looseness of muscles, better blood circulation in the body. And other hand, a deep feeling of comfort and mind balance is created, and than, symptoms of stress are reduced.[45] Fear and anxiety increase adrenaline and noradrenaline acting. This can disturb uterine contractions and decrease the duration of labor.[46] Fear and pain affect the body's circulatory system, respiratory system, endocrines and other tasks. That would result in increase cesarean and instrumental labor rate and reduce the Apgar score.[47]

However, reflexology results in the secretion of natural painkillers (enkephalins and endorphins) in the body, while adrenaline and noradrenaline levels decrease.[48] Thus, the neuronal transmission of the pain message to the brain is stopped and the level of anxiety and pain is reduced, so it can be used to reduce labor pain.[47] It also appears that reflexology during labor promotes relaxation, which can build a woman's confidence to dealing with pain. It is a non-invasive treatment that may assist mother when certain medications and interventions are contraindicated due to advancing gestation.[49] In recent years, reflexology in midwifery has become increasingly important. It can reduce the use of pain relievers during labor. It can reduce the rate of the elective cesarean section which is due to the fear of vaginal delivery.[50] Reflexology is a simple and convenient technique that requires no hardware tools at reducing the feeling of labor pain.[15] Majority of the mothers (89.71%) believed that reflexology was an effective technique in labor pain[51]. The intervention resulted in a significant reduction of pain after the intervention[52], using less Entonox gas[53], labor duration was averagely reduced 6-7 hours.[54] Reflexology may facilitate labor by increasing uterine contractions, reducing pain and the need for intervention.[48] Pregnant women who applied foot reflexology during labor perceived painless than the control group.[55]

The application started at the beginning of the active phase of labor and it was applied in the durations of 10 to 60 minutes. Ideally, in the first stage of labor with 3-4 cm dilatation, uninterrupted and accurate

reflexology techniques, starting from the right foot and being was applied for a total of 15-30 minutes for each foot. Only uterus reflex point was used in 44% of the investigated studies[31-34] and general reflexology points comined with uterus point was used in remaining 56%.[15,25,29,30,35] All applications to the right foot are repeated in the left foot. Massage was recommended to be done once a week in the first trimester and 2-3 times a week in the third trimester for 10-60 minutes.[56]

In the literature, there are different one-dimensional and multi-dimensional assessment tools for determining the severity of pain.[57] One-dimensional scales used in pain assessment are the Verbal Category Scale, Numerical Scales, Visual Analogue Scale (VAS), Burford Pain Thermometer (BAT). Multidimensional scales are The Mcgill Pain Questionnaire (MPQ), Dartmount Pain Questionnaire, Behavioral Models, Pain Perception Profile, Wisconsin Short Pain Chart, Reminder Pain Evaluation Card, West Haven-Yale Multidimensional Pain Chart. VAS scale is commonly used for the assessment of labor pain because of high sensitivity in pain assessment, easy to apply for patients over five years old, a successful method in evaluating pain relief and sufficient sensitivity to assess the effects of treatment.[58] In investigated studies, it was found that VAS is frequently used as a tool for assessing pain severity.

Based on literature search, there is one systematic review and one review researching the effect of reflexology on the severity of labor pain.[59,60] Sharifi et al. [59] reviewed seven clinical trials that examined the effect of reflexology on labor pain. The positive effect of reflexology on labor pain is in agreement with the results of the present study. In a review of Hakim et al.[60], who analyzed the effects of foot reflexology for women and fetal wellbeing in labor, they found that foot reflexology can reduce labor pain intensity. It was also decreased anxiety, duration, blood pressure, pulse, hemorrhage. On the other hand, there was a significant increase in Apgar scores, uterine contractions, and maternal satisfaction.[60-61] Nasiri et al.[61] conducted a systematic review to investigate the efficacy of reflexology studies in Iran. They found that reflexology is an alternative treatment that promotes relaxation. In a systematic review that is determined of the effect of massage on pain and duration of labor, Ganji and colleagues reported that massage was effective in reducing pain in the first stage of labor.[62]

Ernone et al.[63] performed a qualitative study aimed at examining reflexology experiences in pregnant women. In this study, participants described a positive and optimistic experience of increasing their sense of self-efficacy, pain and anxiety levels were reduced, which was consistent with the results of the present study.

Nasiri et al.[61] performed a systematic review of 47 clinical trials examining the effects of reflexology on fatigue, patern of sleep, labor length, post-chemotherapy vomiting, physiological parameters of Pre-Menstrual Syndrome (PMS), low back pain, anxiety and constipation. They found that out of the 20 pain studies published, 18 reported that reflexology reduced pain. However two studies reported this method ineffective. Studies have also reported that reflexology reduces pain after cesarean section and hysterectomy.[64]

One of the most important limitations of this study is the inability to perform meta-analysis due to differences in reflexology methods as well as different control groups. Several issues raised from the RCTs included in this review require further investigation and evaluation. According to the RCTs included in this review, the methods of the studies included in the review was mixed. Most of the studies provided limited information about their methods. Minimising bias in these trials was challenging.

The limitation of the review is that it included a small number of trials with small sample sizes. Further studies with more variables are needed to better determine the effects of using reflexology for labor pain relief. Another limitation of the studies is that reflexology was applied only once in the active phase of labor to the experimental group. However, reflexology might be applied during the latent phase or after the patient enters the labor ward without any prohibition in the first stage of labor. In addition, the effect of reflexology should be examined more frequently (twice or three times).

The next issue is about the reflexology environment which being unclear, due to the extreme effects of the quiet environment on the results of the process.

Much research has focused on the impact of reflexology on the reflex points of the uterus. We suggest that a full reflexology process is performed to achieve better outcomes

CONCLUSION

One of popular types of complementary and alternative medicine, Reflexology, is recommended in maternity hospitals to promote the wellbeing of pregnant mothers and their fetuses during labor.

Despite the challenges outlined above, this systematic review provides clear evidence that foot reflexology can reduce the duration of labor and the intensity of pain. It is a low-cost, complex equipment-free intervention.

However, to reach a definitive conclusion, it is necessary to conduct Randomized Clinical Trials (RCTs) with sufficient statistical power.

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