



ORIGINAL PAPER

The effect of foot baths on foot pain and leg edema of nursing students during clinical training

Sevim Çelik , Gülbahar Cerrah , Berşan Gürel , Cavide Sağlık , İrem Albayrak 

Department of Nursing, Bartın University Faculty of Health Sciences, Bartın, Turkey

ABSTRACT

Introduction and aim. Edema and pain may occur in the lower extremities due to the long-term standing work of nursing students and the stress they experience. In this study, the aim was to determine the effect of foot baths applied after clinical practice on foot pain and leg edema in nursing students.

Material and methods. This randomized controlled study was carried out with second year nursing students. The intervention group received a foot bath (including immersion in water and massage). No intervention was performed on the control group. The data was collected using a survey form, edema follow-up form, visual analog scale, and foot bath equipment.

Results. Edema levels in the right tibia decreased statistically on the 1st and 2nd days after the foot bath compared to the values measured after nurses performed clinical practice, while the edema level in the left tibia decreased significantly in the first and fourth weeks ($p < 0.05$). The right and left foot pain scores in the intervention group increased in the evening of the day after the clinical practice compared to before clinical practice, and pain scores decreased statistically significantly after foot bath ($p < 0.001$). The foot pain scores expressed by the students in the first week increased continuously ($p < 0.001$).

Conclusion. The study showed that a foot bath performed after clinical practice were effective for easing foot pain and leg edema.

Keywords. clinical training, foot pain, foot bath, leg edema, massage, nursing student

Introduction

Nursing education in our country includes theoretical and applied education. This nursing education covers at least four years or 4600 hours of theoretical and practical training. Students complete half of this training (2300 hours) under clinical settings.¹ They begin full-time clinical practice in order to use the knowledge they have acquired in order to gain the skills required for patient care of nursing education.^{2,3}

Clinical settings are environments made up of a variety of physical, psychological, emotional and organizational factors that can affect student learning. In most of the clinical environments, the environments where students can rest are insufficient. The students experience

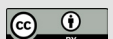
physiological, psychological, social and environmental stress because they have to work for a long time in clinical learning environments and apply treatment and care practices for the first time in the clinical setting.²⁻⁶

Problems such as edema and pain may occur in the lower extremities due to the long-term standing work of the students and the stress they experience. Eyi and Eyi found that second-year students (62.9%) experienced statistically significantly more stress during clinical practice than third-year students (37%) ($p = 0.002$).⁷ Elyased stated that 71.1% of students experienced pain in the ankle or foot (43.9%) over the a 12 month period in their study investigating musculoskeletal disorders of students during their clinical training. In the same study, the prevalence

Corresponding author: Sevim Çelik, e-mail: sevimakcel@gmail.com

Received: 5.04.2023 / Revised: 5.05.2023 / Accepted: 9.05.2023 / Published: 30.09.2023

Çelik S, Cerrah G, Gürel B, Sağlık C, Albayrak İ. *The effect of foot baths on foot pain and leg edema of nursing students during clinical training.* *Eur J Clin Exp Med.* 2023;21(3):476–482. doi: 10.15584/ejcem.2023.3.5.



of musculoskeletal problems was found to be statistically significantly higher in students who performed clinical practice 2 days a week ($p=0.05$).⁸ Similarly, Moodley et al. reported that 63.6% of nursing students experienced foot and ankle pain in the last 12 months.⁹ Kamalruzaman et al. stated that clinical education is an important risk factor for students to experience musculoskeletal problems ($p=0.047$) (95%CI: 0.035, 5.526).¹⁰

Today, foot baths and foot massages are two popular applications because they are easy, applicable, inexpensive, safe, and non-invasive method of relieving foot pain and fatigue. Hot foot baths can increase peripheral temperature and peripheral blood flow without increasing body temperature and can be effective in relieving fatigue by reducing tension in the brain and muscles.¹¹ In foot massage, mental and psychological relaxation is provided by manipulation of soft tissues and muscles, thus increasing healing and relaxation.¹² In a study conducted by Lee et al. in previous years, it reported that edema, physical stress and fatigue in the lower extremities significantly reduced by immersing the feet in hot water at 40 degrees for 20 minutes 12 times a day in operating room nurses who stood for long period.¹³ Oh and Gang also stated that a foot bath, including a 20-minute foot massage, is effective in reducing fatigue and stress.¹⁴ Rahmani et al. reported that the sleep quality of the patients decreased significantly on the second and third nights with a 20-minute foot bath and massage.¹² In previous years, there were very few studies on the subject and these studies focused more on the effect of footbath on fatigue and sleep on the patients and nursing. Studies on nursing students are rare. In our country, there is no study on the subject among nurses and nursing students.

Aim

In this study, unlike other studies, the aim was to determine the effect of foot baths and foot massage applied after clinical applications on foot pain and leg edema in nursing students.

Materials and methods

Ethical approval

First, permission was obtained from the University's Social and Human Sciences Ethics Committee (decision no. 10, dated 18.03.2020). Written permission was obtained from the Rectorate of the university where the study conducted. Informed consent obtained from the students by stating that the purpose of the research, the data will be used for scientific purposes, and that participation in the study was based on volunteerism.

Design and sample

The study adopted a randomized controlled study to determine the effect of foot baths applied after clinical applications on foot pain and leg edema in nursing students.

This study was carried out with second year students studying in the nursing department of the faculty of health sciences and practicing clinical for 12 hours a week in the 2021-2022 academic year. Forty-four students were included in the sample with a medium effect size of 0.25, a type 1 error of 0.5, and a power of 80%, which Cohen determined for repeated analysis of variance in the G power program. Since there may be students who can leave the study, the number of sample was increased by 50% and the sample group consisted of 66 students.

The block randomization method used in the study. Sixty-six students were enumerated and assigned to two block sizes, each of which determined by the researchers as the intervention and control group with a ratio of 1:1 (www.randomizer.org). The sample group was determined as 33 students in each block. The study completed with 27 intervention and 21 control group students (Fig. 1).

The inclusion criteria: (1) no hearing or vision problems, (2) continuing clinical training, (3) have no diagnosed leg problems, (4) have a smart phone and (5) wearing sports shoes, (6) studying in the second year, (7) agreed to participate.

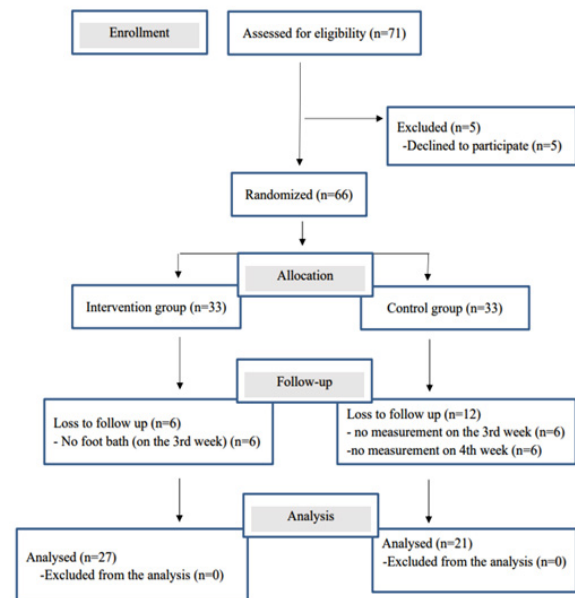


Fig. 1. CONSORT flow diagram

Instruments

The data collected using a survey form, edema follow-up form, visual analog scale, foot bath equipment, tape measure and smart phone.

The survey form

This form consist of items on students' age, gender, height, weight, daily sleep time, daily standing time, smoking and alcohol use, daily salt use, daily coffee consumption, general health definition status, foot health

definition status, working status, chronic disease, chronic disease, clinical setting, and exercise status.

Edema measurement and follow-up form

In the evaluation of edema, the patient's tibia bone is pressed with a finger for 3-5 seconds, and if there is a pit in the area, the depth of the pitting and how long it takes to come back are determined, and the edema is graded. If the godet's sign comes back in 2 mm and 15 sec, 1 positive, 4 mm and if it comes back in 15-30 sec, 2 positive, 6 mm and if it comes back in 30-45 sec, 3 positive, 8 mm and longer than 45 sec. If it comes back in time, it is expressed as 4 positive edema.¹⁵

Before going to the clinical practice every week, the students record the level of edema in their lower extremities on the edema follow-up form on the first evening of the clinical practice and the last evening of the clinical practice.

Pain follow up form

This form is a form in which students evaluate and record the level of pain in their lower extremities every week before going to clinical practice, on the first evening of clinical practice and on the last evening of clinical practice.

Visual analogue scale

It is a reliable and easily applicable scale used to measure the severity of pain in patients, accepted in the world literature. For pain intensity over a 10cm line, "no pain" is usually rated 0 points and "worst pain imaginable" 10 points.

Materials for the footbath and foot massage

A bucket used to put the water in the foot bath, a water thermometer to measure the temperature of the water, a foot towel, and pH neutral baby oil suitable for use on the skin used for foot massage.

Smartphone

It was used to send the training video prepared by the researchers to the students for the application of the footbath, the follow-up of the edema.

Data collection

Data was collected between 06.12.2021 and 31.12.2021. The intervention group was shown the application of foot bath in the skill laboratory, and follow-up of edema. In addition, the making of these applications videotaped, and the video recording sent to the students via smartphones so that they could watch the applications again. Data collection forms introduced to all students and given to completed after the applications, and they were collected from them at the end of a month.

Application of footbath

Application was performed by students in the intervention group in accordance with the application steps. The footbath done two hours before bedtime and lasted for 20 minutes. For this application, you should stand in a sitting position on a chair or bed, and the feet should hung down. First, the feet should kept for 6 minutes in a bowl filled with 40 degrees water up to 10 cm above the ankle. Then a foot massage should done for 8 minutes, and then kept in a bowl filled with 40 degrees water for 6 minutes.^{6,13}

Application of foot massage

For foot massage, when the feet removed from the water, they should dried with a towel and the feet should extended by placing a towel under the feet in the bed. Massage should started by lubricating the hands with baby oil. For foot massage, firstly, the toes should rubbed with the help of the hands and stretched towards the fingertips. The feet should grasped by the heel and ankle and turned clockwise and counter clockwise once. Slight pressure should applied to the feet with circular movements from the sole of the foot to the toes. Then one hand should held on the ankle so that the other hand grasps the toes, the toes should pushed forward slowly. Foot massage should last 4 minutes for each foot.^{6,13}

Statistical analysis

Descriptive statistics such as number, percentage, mean and standard deviation used in the evaluation of the data obtained. Whether the data showed normal distribution or not evaluated with the Kolmogorov-Smirnov (K-S) test. Data did not normally distributed. Data evaluated with Chi-square test, Fisher's exact test, Friedman test and Mann Whitney U test. Pairwise comparisons were examined using the Wilcoxon sign-rank test. A p value less than 0.05 considered statistically significant.

Results

There was no statistically significant difference in the intervention and control groups, and the groups were homogeneous (Table 1).

In table 2, right and left tibia edema levels of the students in the intervention group are compared before and after the clinical practice for four weeks. Accordingly, the edema levels measured from the right and left tibia of the students before and after the foot bath before and after the clinical practice varied between 0 and 2+. The edema levels measured from the right and left tibia before the evening foot bath on the 1st day after the clinical practice every week increased. In the follow-up for one month, the edema levels in the right tibia decreased statistically on the 1st and 2nd days after footbath compared to the values measured after the clinical practice, while the edema level in the left tibia decreased signifi-

cantly in the first and fourth weeks ($p < 0.05$). In the four-week follow-up, the edema levels of the students in the right and left tibia showed a statistically significant difference ($p < 0.001$).

Table 1. Comparison of the characteristics of the students^a

Characteristic		Intervention Group	Control Group	Statistics test *
		Mean (SD)	Mean (SD)	
Age		20.59 (1.64)	19.95 (0.78)	Z=-1.328 p=0.184
Height (cm)		168.37 (7.94)	168.05 (7.18)	Z=-0.212 p=0.832
Weight (kg)		65.44 (23.99)	60.18 (10.20)	Z=-0.111 p=0.912
Sleep time (hour/day)		7.19 (1.03)	7.73 (1.07)	Z=-1.737 p=0.832
Standing time (hour/day)		8.04 (3.20)	8.91 (3.50)	Z=-0.587 p=0.557
		n (%)	n (%)	Statistics test
Gender	Female	21 (77.8)	16 (72.7)	** $\chi^2=0.167$
	Male	6(22.2)	6 (27.3)	p=0.747
Working status	working	1 (3.7)	1 (4.5)	** $\chi^2=0.033$
	not working	26 (96.3)	20(95.5)	p=1.000
Smoking	Yes	4 (14.8)	4 (19.0)	** $\chi^2=0.152$
	No	23(85.2)	17(81.0)	p=0.715
Salt consumption (daily)	More	3 (11.1)	-	*** $\chi^2=2.601$
	Middle	16 (59.3)	13 (61.9)	p=0.272
	Little	8 (29.6)	8 (38.1)	
Coffee consumption (daily)	Not consume	11 (40.7)	13 (61.9)	*** $\chi^2=4.825$
	One cup	10 (37.0)	2 (9.5)	p=0.090
	Two cups	6 (22.2)	6 (28.6)	
Perceived general health status	Excellent	1 (3.7)	-	*** $\chi^2=0.990$
	Very good	9 (33.3)	6 (28.6)	p=0.609
	Good	17 (63.0)	15 (71.4)	
Perceived foot health status	Excellent	2 (7.4)	2 (9.5)	*** $\chi^2=1.665$
	Very good	10 (37.0)	8 (38.1)	p=0.645
	Good	13 (48.1)	11 (52.4)	
	Poor	2 (7.4)	-	
Exercise status	Not doing	7 (25.9)	7 (33.3)	*** $\chi^2=2.581$
	Irregular	17 (63.0)	14 (66.7)	p=0.275
	Regular	3 (11.1)	-	
Clinical learning setting	General services	16 (59.3)	19 (90.5)	*** $\chi^2=6.056$
	Intensive care	2 (7.4)	-	p=0.048
	Private practice rooms	9 (33.3)	2 (9.5)	

^a *Z – Mann Whitney U test; ** χ^2 – Fisher’s Exact test; *** χ^2 – Chi-square test

In pairwise comparisons performed using the Wilcoxon signed ranks test, the degree of edema in the right tibia significantly increased ($p=0.034$) before and after clinical practice on the evening of the first day without foot bath, in the first week ($p=0.034$), third week ($p=0.034$) and fourth week ($p=0.008$). However, there was no statistically significant difference in the evaluated edema degrees on the first and second evenings after clinical practice ($p > 0.05$). The degree of edema in the left tibia was found to increase significantly ($p=0.003$) on the first day of the evening without performing a foot bath after clinical practice compared to before clinical practice in the first week, while there was no statistically significant difference between the degree of edema for other pairwise comparisons ($p > 0.05$). These findings were clinically significant.

There was no significant difference between the degrees of edema in the right and left tibia in all comparisons made for the second, third, and fourth weeks ($p > 0.05$). However, the degree of edema in the left tibia was found to increase significantly ($p=0.003$) between the fourth week before clinical practice and the first day of the evening before performing a foot bath, whereas it decreased significantly ($p=0.008$) after the foot bath on the same day. These findings were clinically significant.

Table 2. Comparison of right and left tibia edema levels of students in the intervention group before and after clinical practice^a

Measurement time	1 st week	2 nd week	3 rd week	4 th week	Statistics test
	Mean (SD)	Mean(SD)	Mean (SD)	Mean (SD)	
Pre-clinical evening	0.67 (0.62)	0.70 (0.60)	0.70 (0.60)	0.70 (0.60)	
Evening of the 1st day after clinical practice (before foot bath)	0.89 (0.75)	0.89 (0.75)	0.96 (0.80)	0.96 (0.80)	
Evening of the 1st day after clinical practice (after foot bath)	0.70 (0.60)	0.70 (0.60)	0.70 (0.60)	0.74 (0.65)	$\chi^2=54.683$ $p < 0.001$
Evening of the 2nd day after clinical practice (after foot bath)	0.70 (0.60)	0.74(0.65)	0.74 (0.65)	0.74 (0.65)	
Statistics test	$\chi^2=11.000$ $p=0.012$	$\chi^2=8.500$ $p=0.037$	$\chi^2=12.356$ $p=0.006$	$\chi^2=17.571$ $p=0.001$	
Pre-clinical evening	0.63 (0.56)	0.74 (0.65)	0.70 (0.60)	0.67 (0.55)	
Evening of the 1st day after clinical practice (before foot bath)	0.96 (0.80)	0.89 (0.75)	0.89 (0.75)	1.00 (0.83)	
Evening of the 1st day after clinical practice (after foot bath)	0.70 (0.60)	0.78 (0.75)	0.74 (0.65)	0.74 (0.65)	$\chi^2=125.928$ $p < 0.001$
Evening of the 2nd day after clinical practice (after foot bath)	0.70 (0.60)	0.74 (0.65)	0.74 (0.65)	0.74 (0.65)	
Statistics test	$\chi^2=20.778$ $p < 0.001$	$\chi^2=5.824$ $p=0.121$	$\chi^2=7.080$ $p=0.069$	$\chi^2=20.778$ $p < 0.001$	

^a χ^2 – Friedman test; SD – standard deviation

In table 3, right and left tibia edema levels of the students in the control group compared before and after the clinical practice for four weeks. Accordingly, the edema levels measured by the students from the right and left tibia before clinical practice increased at the end of each week. However, the increase in edema levels in the right and left tibia only in the first week showed a statistically significant difference ($p < 0.05$). In addition, the changes in the edema levels in the left tibia of the students during the follow-up for four weeks showed a statistically significant difference ($p < 0.05$).

In pairwise comparisons, the degree of edema in both the right ($p=0.046$) and left ($p=0.046$) legs before clinical practice showed a statistically significant increase on the evening of the second day after clinical practice.

Table 3. Comparison of right and left tibia edema levels of students in the control group before and after clinical practice ^a

Measurement time	1 st week	2 nd week	3 rd week	4 th week	Statistics test
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Pre-clinical evening	0.90 (0.30)	0.95 (0.38)	0.90 (0.30)	0.90 (0.30)	c ² = 19.417 p=0.054
Evening of the 1st day after clinical practice	0.95 (0.38)	0.95 (0.38)	0.95 (0.38)	1.00 (0.44)	
Evening of the 2nd day after clinical practice	1.10 (0.53)	1.05 (0.49)	1.00 (0.44)	1.00 (0.44)	
Statistics test	c ² = 6.500 p=0.039	c ² = 2.000 p=0.368	c ² = 3.000 p=0.223	c ² = 2.267 p=0.264	
Pre-clinical evening	0.90 (0.30)	0.90 (0.30)	0.95 (0.38)	0.90 (0.30)	c ² = 21.342 p=0.030
Evening of the 1st day after clinical practice	0.95 (0.38)	0.95 (0.38)	0.95 (0.38)	0.95 (0.38)	
Evening of the 2nd day after clinical practice	1.10 (0.53)	1.05 (0.49)	1.05 (0.49)	1.00 (0.44)	
Statistics test	c ² = 6.500 p=0.039	c ² = 4.467 p=0.097	c ² = 2.000 p=0.368	c ² = 3.000 p=0.223	

^a c² – Friedman test; SD – standard deviation

When table 4 was examined, the right and left foot pain scores in the intervention group increased in the evening of the day after the clinical practice compared to before clinical practice, and pain scores decreased statistically significantly after footbath (p<0.001). In addition, the changes in the pain scores of the students in the right and left legs showed a statistically significant difference in the follow-up for four weeks (p<0.001).

On the first day of the first week after clinical practice the level of pain in the right foot was found to increase significantly compared to before clinical practice both before (p=0.008) and after (p<0.001) the foot bath. However, there was no statistically significant difference in the level of pain in the right foot between before the foot bath on the first day and after the foot bath on the first and second days (p>0.05). All pairwise comparisons except for the level of pain in the right foot showed statistically significant differences during the second week, third week, and between before clinical practice and after the foot bath on the second day (p<0.05). The application of foot bath before and after the second day of clinical practice in the 4th week did not have a significant effect on the level of pain in the right foot (p>0.05). Similarly, there was no significant effect of foot bath applied after the first day of clinical practice and after the second day of clinical practice on the level of pain in the right foot (p>0.05). All other pairwise comparisons made on the right foot were statistically significant (p<0.05). In the pairwise comparisons conducted to evaluate the level of pain in the left foot, except for the foot bath performed on the first day after the clinical practice, all other pairwise comparisons had a significant effect on foot pain (p<0.05). These findings were clinically significant.

Table 4. Comparison of right and left foot pain levels of students in the intervention group before and after clinical practice ^a

Measurement time	1 st week	2 nd week	3 rd week	4 th week	Statistics test
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Pre-clinical evening	1.00 (1.25)	0.92 (1.31)	0.88 (1.29)	1.16 (1.65)	c ² =152.410 p<0.001
Evening of the 1st day after clinical practice (before foot bath)	3.84 (2.41)	3.58 (1.81)	3.54 (2.43)	3.16 (2.32)	
Evening of the 1st day after clinical practice (after foot bath)	2.24 (2.20)	2.00 (2.04)	1.75 (1.64)	1.76 (1.66)	
Evening of the 2nd day after clinical practice (after foot bath)	2.28 (2.33)	1.96 (1.62)	2.17 (2.05)	1.76 (1.73)	
Statistics test	c ² = 46.070 p<0.001	c ² = 38.242 p<0.001	c ² = 33.292 p<0.001	c ² = 22.929 p<0.001	
Pre-clinical evening	0.92 (1.24)	0.96 (1.57)	1.08 (1.55)	1.04 (1.39)	c ² = 84.194 p<0.001
Evening of the 1st day after clinical practice (before foot bath)	3.63 (2.12)	3.63 (2.12)	3.48 (2.36)	2.92 (2.26)	
Evening of the 1st day after clinical practice (after foot bath)	2.13 (1.54)	2.13 (1.54)	2.16 (2.01)	1.83 (1.68)	
Evening of the 2nd day after clinical practice (after foot bath)	1.67 (1.43)	1.67 (1.43)	1.84 (1.88)	1.67 (1.81)	
Statistics test	c ² = 39.192 p<0.001	c ² = 35.220 p<0.001	c ² = 29.145 p<0.001	c ² = 21.672 p<0.001	

^a c² – Friedman test; SD – standard deviation

Table 5. Comparison of right and left foot pain levels of students in the control group before and after clinical practice ^a

Measurement time	1 st week	2 nd week	3 rd week	4 th week	Statistics test
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Pre-clinical evening	0.86 (1.95)	1.05 (1.39)	1.10 (1.37)	0.90 (1.37)	c ² = 127.493 p<0.001
Evening of the 1st day after clinical practice	3.62 (1.83)	3.90 (2.27)	4.29 (2.19)	3.71 (1.84)	
Evening of the 2nd day after clinical practice	3.67 (1.90)	3.76 (1.92)	3.52 (2.18)	3.57 (1.93)	
Statistics test	c ² = 25.241 p<0.001	c ² = 26.732 p<0.001	c ² = 28.587 p<0.001	c ² = 26.297 p<0.001	
Pre-clinical evening	0.95 (1.35)	1.05 (1.35)	1.10 (1.22)	0.95 (1.20)	c ² = 131.322 p<0.001
Evening of the 1st day after clinical practice	3.62 (1.43)	3.81 (2.25)	4.19 (2.01)	3.76 (1.75)	
Evening of the 2nd day after clinical practice	3.90 (1.70)	3.57 (1.96)	3.81 (1.86)	3.57 (1.66)	
Statistics test	c ² = 31.444 p<0.001	c ² = 21.658 p<0.001	c ² = 28.987 p<0.001	c ² = 27.029 p<0.001	

^a c² – Friedman test; SD – standard deviation

In Table 5, the right and left foot pain scores of the students in the control group increased in the evening of the day after clinical practice compared to the day before

clinical practice. The pain scores expressed by the students in the right and left foot in the first week increased continuously, unlike the other weeks, and the scores that increased in the evening of the day after clinical practice in the other weeks decreased in the evening of the 2nd day compared to the 1st day ($p < 0.001$). In the four-week follow-up, the changes in the pain scores of the students in the right and left foot showed a statistically significant difference ($p < 0.001$). All pairwise comparisons made using the Wilcoxon signed ranks test showed statistically significant differences ($p < 0.05$).

Discussion

In this study, the effect of foot bath and foot massage applied after clinical practices in nursing students on foot pain and leg edema was evaluated for four weeks before and after weekly clinical practice. It was determined that the level of tibia edema in the right and leg, which increased after clinical applications of the 20-minute foot bath and 8-minute (total for both feet) foot massage applied before going to bed by the nursing students decreased at the end of each week ($p < 0.05$). Although tibia edema in the left leg decreased at the end of each week, this decrease was significant in the 1st and 4th weeks ($p < 0.05$). This result showed that when foot bath and foot massage were applied together, it had a significant effect on lower extremity edema. It is seen that this finding is compatible with studies conducted in previous years. In the studies of Seo et al., they were reported that footbath performed for 20 minutes 3 times a week before going to bed was effective in reducing edema in both legs in nursing students ($p < 0.001$).^{6,11} Lee et al. reported that footbath applied for 20 minutes reduced tibia edema in operating room nurses who stood for long periods of time ($p < 0.05$).¹³ Oh and Yoon also found that leg massage applied by the nurses for 10 minutes reduced leg edema.¹⁶

In this current study, it was found that the footbath and foot massage applied by nursing students were effective in reducing the increasing foot pain after clinical practice ($p < 0.001$). The foot pain score, which increased to an average of 3 points on the evening of the first clinical practice every week in the intervention group, fell below 3 points at the end of the week. The foot pain score, which increased after clinical practice in the control group, was still above 3 points at the end of the week ($p < 0.001$). A single study was found to reduce the increased pain sensation after clinical practice of foot bath and foot massage in nurses or nursing students. In this study conducted by Oh and Yoon, it was reported that the foot pain score, which was 5 on average after working in the clinic, decreased to an average of 4 points after the leg massage performed by the nurses themselves, and this result was statistically significant.¹⁶ Also, in the

literature, it is emphasized that foot bathing by immersing the feet in water reduces foot pain by stimulating tactile sensations and reducing sympathetic nerve activity.^{12,17}

Study limitations

This study had three main limitations. First, the study conducted only with second-year nursing students. Second, participants may not have filled out the forms correctly because they made the measurements themselves. Third, participants may not have watched or worked on the video adequately.

Conclusion

In this study, it was determined that nursing students experienced foot pain and leg edema after clinical practice. In addition, the study showed that foot bath and foot massage performed before bedtime after clinical practice were effective in reducing students' foot pain and leg edema. Foot baths may be applied as an effective intervention to decrease leg edema and foot pain among nursing students during clinical training. The limited number of studies on the subject in previous years makes the results of this study important.

Acknowledgments

The authors would like to thank the nursing students who participated in the study.

Declarations

Funding

This study supported by the Scientific and Technological Research Council of Turkey (TUBITAK) within the scope of 2209-A - University Students Research Projects Support Programme.

Author contributions

Conceptualization, S.Ç. and G.C.; Methodology, S.Ç. and G.C.; Software, S.Ç.; Validation, S.Ç.; Formal Analysis, S.Ç.; Investigation, G.C., B.G., C.S., İ.A...; Resources, S.Ç. and G.C.; Writing – Original Draft Preparation, S.Ç., G.C., B.G., C.S., İ.A.. Visualization, S.Ç. G.C.; Supervision, S.Ç. and G.C.; Project Administration, S.Ç. and G.C.; Funding Acquisition, S.Ç. and G.C.

Conflict of interest

The authors report no conflicts of interests.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics approval

Study was approved by the University's Social and Human Sciences Ethics Committee (decision no. 10, dated 18.03.2020).

References

1. Bahçecik N, Alpar SE. Nursing education in Turkey: from past to present. *Nurse Educ Today*. 2009;29(7):698-703. doi:10.1016/j.nedt.2009.05.008
2. Arkan B, Ordin Y, Yılmaz D. Undergraduate nursing students' experience related to their clinical learning environment and factors affecting to their clinical learning process. *Nurse Educ Pract*. 2018;29:127-132. doi: 10.1016/j.nepr.2017.12.005
3. Bilgiç Ş, Çelikkalp Ü. Assessment of nursing students' stress levels and coping strategies during first clinical experience. *Clin Exp Health Sci*. 2021;11(3):437-443. doi: 10.33808/clinexphealthsci.777904
4. Bodys-Cupak I, Ścisło L, Kózka M. Psychosocial determinants of stress perceived among polish nursing students during their education in clinical practice. *Int J Environ Res Public Health*. 2022;19(6):3410. doi: 10.3390/ijerph19063410
5. Khater W, Akhu-Zaheya L, Shaban I. Sources of stress and coping behaviours in clinical practice among baccalaureate nursing students. *Int J Human Soc Sci Res*. 2014;4(6):194-202.
6. Seo S, Han H, Yeon S. Contribution of foot bath to fatigue relief measured by using smart phone applied questionnaires. *Int J Adv Sci Eng Inf Technol*. 2018;113:113-122. doi: 10.14257/ijast.2018.113.12
7. Eyi S, Eyi İ. Nursing students' occupational health and safety problems in surgical clinical practice. *SAGE Open*. 2020;10(1):2158244020901801.
8. Elsayed AA. Work-related musculoskeletal disorders among nursing students during clinical training. *Am J Nurs*. 2019;7(6):952-957. doi: 10.12691/ajnr-7-6-7
9. Moodley M, Ismail F, Kriel A. Work-related musculoskeletal disorders amongst undergraduate nursing students at the University of Johannesburg. *Health SA Gesondheid*. 2020;25:a1460. doi: 10.4102/hsag.v25i0.1460
10. Kamalruzaman NSA, Tengku Sabri TA, Isa SNI. Musculoskeletal disorders and quality of life among undergraduate health sciences students: A cross-sectional study. *Healthscope*. 2021;4(1):99-105.
11. Seo S, Yoon M, Yeon S. Effects of foot bath on leg edema and fatigue among college students. *J Korean Soc Sch Health*. 2017;30(1):21-28. doi: 10.15434/kssh.2017.30.1.21
12. Rahmani A, Naseri M, Salaree MM, Nehrir B. Comparing the effect of foot reflexology massage, foot bath and their combination on quality of sleep in patients with acute coronary syndrome. *J Caring Sci*. 2016;5(4):299-306. doi: 10.15171/jcs.2016.031
13. Lee SY, Kyung PH, Jea KH, Hee JY. Effects of foot therapy on operating room nurses' lower extremities edema, stress, and fatigue. *J Korean Acad Nurs*. 2014;20(1):102-112. doi: 10.22650/JKCNR.2014.20.1.102
14. Oh S, Gang GH. Effects of footbaths on stress and exhaustion for high school senior students-a comparative study on the aroma oil and fermentation extract. *Journal of the Korea Academia-Industrial Cooperation Society*. 2010;11(1):402-408. doi:10.5762/KAIS.2010.11.1.402
15. Sert H, Olgun N. Yoğun bakımda ödem ve dehidratasyon. *Yoğun Bakım Hemşireliği Dergisi*. 2016; 20(1): 24-36.
16. Oh J, Yoon CM. Lower extremity edema and pain of nurses and the effect of self leg massage. *J Korean Acad Nurs*. 2008;38(2):278-286. doi: 10.4040/jkan.2008.38.2.278
17. Koraş Sözen K. [The effect of foot massage on postoperative pain level]. *Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi Dergisi*. 2020;15(2):110-115. doi: 10.17517/ksutfd.67335