REVIEW ORIGINAL RESEARCH

EFFECT OF USING HALLUX VALGUS SPLINT ON HALLUX VALGUS PAIN IN TEACHERS

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Abstract: Female teachers often use high heels in their work activities, which causes musculoskeletal problems such as hallux valgus. Hallux valgus can cause pain around the first metatarsophalangeal joint. One of the treatments for hallux valgus is a hallux valgus splint which works as a big toe corrector. This study aims to determine the effect of using hallux valgus splints on pain due to hallux valgus on teachers and employees at public elementary schools in the Kemangkon district.

Purpose: The purpose of this study was to determine the effect of using a hallux valgus splint on pain due to hallux valgus in teachers and employees at State Elementary Schools in Kemongkon District.

Patients and methods: This research is a quasi-experimental research with one group pre and post-test design. The subjects in this study were teachers and employees at a public elementary school in the Kemangkon district as many as 22 people with hallux valgus pain. Subjects were given an intervention using a hallux valgus splint and pain measurements were made using a numeric rating scale (NRS).

Results: Hypothesis testing using paired sample t-test showed that the use of hallux valgus splint could reduce hallux valgus pain $p = 0.000$ ($p < 0.05$), statistically there was an effect.

Conclusion: It can be concluded that there is an effect of using a hallux valgus splint on pain due to hallux valgus on teachers and employees at public elementary schools in Kemangkon District.

Keywords: *hallux valgus, bunion, hallux valgus splint, pain*

Introduction

Hallux valgus or bunion is a progressive deformity characterized by lateral deviation of the big toe (hallux) and medial deviation of the first metatarsal.[1] According to dr. Pitarini from St. Hospital. Carolus, there are many factors that cause hallux valgus or bunions, including genetic factors, gender, wearing the wrong shoes such as high heels with pointed toes in the long term, or other causes such as degenerative arthritis and joint damage due to age. In addition to changing the bone structure of the feet, hallux valgus also causes discomfort and pain. The bursa at the base of the big toe will thicken and harden due to the pressure of the footwear on the medial eminence.[2] The presence of these lumps will also make the sufferer feel pain, especially when wearing shoes.

Hallux valgus if left untreated can seriously impair the patient's functional status. Conservative management is often the choice in treating hallux valgus. One form of conservative treatment for hallux valgus is the use of a bunion splint or hallux valgus splint. Conservative management of hallux valgus using splints can help relieve pain in patients with hallux valgus.[3]
Teachers are one of the professions that make someone use high heels in their work activities. At least female teachers wear high heels for 5-6 hours per working day.[4] However, the use of high heels

for a long period of time makes the feet stand on tiptoe continuously, it can cause health problems such as the appearance of hallux valgus.[5]

Most of the studies that have been conducted have discussed the prevalence or incidence of hallux valgus based on the use of high heels in the form of an arch of the foot and body mass index (BMI). However, research on the management of hallux valgus is still rare to study.

Material and methods

This study is a type of quantitative research, using the Quasi-Experimental method with a research design of One Group Pretest-Posttest Design. One Group Pretest-Posttest Design is a form of research design that compares the conditions before and after treatment so that the results of the treatment can be known more accurately.[6] This study was conducted at State Elementary Schools in Kemangkon District, namely SD Negeri 1 Kemangkon, SD Negeri 1 Sumilir, SD Negeri 1 Karangtengah and SD Negeri 1 Muntang in March - April 2022.

The target population in this study were teachers and employees at the State Elementary School in Kemongkon District as many as 45 people. In addition, the source population is teachers and employees at the Kemongkon District Elementary School who experience pain due to hallux valgus as many as 22 people.

This study uses a purposive sampling technique so that the sample is based on the inclusion and exclusion criteria that have been set to represent the population in this study.

Inclusion criteria in this study are:

1. Teachers and employees who have mild – moderate hallux valgus
2. Experiencing pain on a scale of more than 2 based on the numeric rating scale
3. Willing to use hallux valgus splint for 4 weeks
4. Willing to wear standard shoes (wide toe box and maximum heel height 2-3 cm)

Exclusion criteria in this study are:

1. Have a history of diseases such as Rheumatoid arthritis, diabetes, gout, leprosy, and other neurological diseases
2. Trauma or fracture of the metatarsophalangeal joint
3. Have surgery on the foot

The instrument in this study used a goniometer to determine the degree of hallux valgus and a numeric rating scale (NRS) to measure the pain scale.

The data of this study were the degree of pain before and after using the hallux valgus splint so that the data obtained was a data ratio.

Results

Characteristics of Research Subjects

In this study, there are characteristics based on the height of the heels, the recommendation for safe heels for health is 3-4 cm so that the leg muscles do not hold the weight (Purba, 2015). Heel height in this study was divided into 3 groups, namely <4 cm, 4-7 cm, and 8 cm. The results of the frequency and presentation can be seen in the table below.

Table 1

Subject characteristics based on heel height

Tinggi hak sepatu (cm)	Frekuensi	Presentase (%)
<4cm	4	18,18
4-7cm	15	68,18
8cm	3	13,63
Total	22	100

In this study, the subjects taken were subjects who experienced mild and moderate hallux valgus. Hallux valgus deformity was classified as mild if the hallux valgus angle was 15°-<20°, and moderate if the hallux valgus angle was 20°-<40°. Hallux valgus pain is associated with local mechanical stimulation or a degenerative process in the first metatarsophalangeal joint. Therefore, it can be hypothesized that more severe deformity may be associated with more severe pain as well.

Table 2

Subject characteristics based on hallux valgus angle

HVA (°)	Frekuensi	Presentase (%)
15 - <20	10	45.45

20 - <40	12	54.54
Total	22	100

Pain Measurement Before and after Treatment

Subjects who had been selected using inclusion and exclusion criteria were then measured for pain using a numeric rating scale and given an intervention, namely the use of a hallux valgus splint for 1 month. After the intervention period was over, pain measurements were made on the subject again. The results of the pre-test pain measurement showed that 45.45% of the subjects experienced mild pain, 27.27% moderate pain, and 27.27% severe pain. Then on post-test pain, there was 90.9% mild pain, and 9.09% moderate pain. The data obtained were then processed and obtained the average results of the pre-test and post-test.

Table 3

Descriptive Statistics Test

	N	Minimum	Maximum	Mean	Std. Deviation
Nyeri pre-test	22	2	8	4.95	1.864
Nyeri post-test	22	0	6	2.23	1.631

Normality test

To find out the statistical test used, it is necessary to do a normality test to find out the distribution of the data. In this study, the normality test used was Shapiro Wilk. Based on the results of the normality test in the table below, it is known that the Shapiro Wilk significance value for the pre-test and post-test pain variables is >0.05, it can be said that the variables are normally distributed. After the normality test, the next step is to test the hypothesis.

Table 4

Normality Test (Shapiro Wilk)

	Statistik	DF	Sig.
Pre-test	.933	22	.141

Post-test	.914	22	0.57

Hypothesis testing

The hypothesis test used in this study is the paired t-test because the results of the normality test show that the data is normally distributed. From the data below, the average value of pain pre-test (4.95) and post-test (2.23) has a difference of 2.72. This indicates a decrease in the average pain score between the pre-test and post-test. The results of the paired t-test hypothesis test are presented in the following table:

Table 5

Statistical Paired Sample T-Test

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test	4.95	22	1.864	.397
Post-test	2.23	22	1.631	.348

Based on the results of the pre-test-posttest hypothesis test on the numerical rating scale assessment using the paired t-test, the p-value = 0.000. This explains that there is an effect of using a hallux valgus splint on hallux valgus pain, it can be stated that the alternative hypothesis is accepted.

Table 6

Paired-sample t-test hypothesis test

				Significance
		t	Df	Sig. (2-tailed)
Pair 1	Nyeri pretest – nyeri post test	16.672	21	.000

Discussion

Currently, there are various designs of foot orthosis for hallux valgus. The purpose of using orthosis in the treatment of hallux valgus is to reduce deformity and relieve pain. Hallux valgus splint is one of the tools used to treat hallux valgus deformity to relieve pain, improve alignment, improve biomechanical function and improve walking patterns.[7] Hallux valgus splint used in this study is a hallux valgus splint made of elastic. This Hallux valgus splint consists of a toe separator and a medial bunion pad made of silicon and other materials, namely flexible fabric. Hallux valgus splint with toe separator reduces pain by aligning the big toe and reducing overstretched collateral ligament and subluxation. The toe separator relieves pain by holding the big toe apart from the other fingers so that the hallux position returns to its anatomical position and reduces the protrusion of the metatarsal head.[8,9]

This study aims to determine the effect of using a hallux valgus splint on pain due to hallux valgus on teachers and employees at public elementary schools in Kemangon District. Based on the hypothesis test paired sample t-test showed a value of $p = 0.000$ ($p < 0.05$). This shows that there is an effect of using a hallux valgus splint on pain due to hallux valgus. The results of this study are supported by research conducted by Chadcavalpanichaya (2018) where the results of the study explained that there was a significant reduction in pain in the study group ($p<0.05$) between before and after intervention in subjects with hallux valgus without serious complications.[7] The same thing was also explained in a study conducted by Laohajaroensombat (2022) where this study compared the effects of using a toe sleeve (bunion pad) with a toe separator in subjects with hallux valgus pain. The results showed that the use of a toe separator and a toe sleeve both significantly reduced pain and increased functional mobility in subjects with mild to moderate hallux valgus and bunion pain.

The toe separator reduces hallux abduction thereby reducing bunion protrusion, while the medial bunion pad covers the bunion area and acts as a bumper between the bunion and the footbed resulting in reduced pain. In addition, prefabricated silicone toe separators have a pain-reducing effect because they allow the soft tissues and nerves in the medial and lateral aspects of the hallux to return to an anatomical position so as to prevent shortening of the soft tissues on the lateral aspect and overstretching of the soft tissues and nerves of the forceps located on the medial aspect of the hallux.[10,11]

Conclusion

This study was conducted from March 28 to April 28, 2022, using 22 subjects who were selected and then measured the degree of pain before and after being given intervention in the form of using a hallux valgus splint for 1 month. The results of the normality test using Shapiro Wilk showed a p-value > 0.05, it can be interpreted that the data is normally distributed. Then the hypothesis test was carried out using a paired t-test resulting in a p-value of 0.000, it can be interpreted that there is a significant effect of using a hallux valgus splint on hallux valgus pain in teachers and employees at public elementary schools in Kemangkon District, Purbalingga, Central Java.

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Disclosure

The author reports no conflicts of interest in this work.

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