International Journal of Integrated Health Sciences (IIJHS)
ISSN Print: 2302-1381; ISSN Online: 2338-4506

Original Article

Effectiveness of Low Level Laser Therapy in Plantar Fasciitis with Obesity

Astri Kusuma Dewi,[1] Tirza Z. Tamin,[1] Dewi Friska[2]

[1]Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia
[2]Department of Community Medicine, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

Article History

Received: February 09, 2026
Accepted: April 29, 2026
Published: June 30, 2026

DOI: 10.15850/ijihs.v14n1.4771
IJIHS. 2026;14(1):30–37

Correspondence:
Tirza Z. Tamin,
Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia,
E-mail : tirzaediva.tamin@gmail.com

Abstract

Background: Plantar fasciitis (PF) is a common cause of heel and occurs more frequently in individuals with obesity than in other population groups. Low-level laser therapy (LLLT) is a non-surgical treatment method for PF; however, current evidence does not demonstrate superior effectiveness compared with conventional treatments.

Objective: To investigate how LLLT impacts patients suffering from plantar fasciitis and obesity.

Methods: This randomized controlled trial included 14 patients with plantar fasciitis and obesity divided into two groups receiving either LLLT with standard therapy or only standard therapy. Intervention was administered three times each week over a four-week period. Outcomes were assessed using the Visual Analogue Scale (VAS), Foot and Ankle Outcome Score (FAOS), and ultrasonography measurements of plantar fascia thickness.

Results: The two groups demonstrated a statistically significant decrease in VAS scores, reaching a threshold of p=0.04. The treatment group showed a more statistically significant reduction in plantar fascia thickness than the control group (p=0.01). The FAOS pain subscale showed a statistically significant improvement in the treatment (p=0.005).

Conclusion: Patients with plantar fasciitis and obesity experience decreased pain intensity, plantar fascia thickness, and FAOS pain scores after receiving four weeks of LLLT treatment.

Keywords: Foot and ankle outcome score, plantar fascia thickness, plantar fasciitis, visual analogue scale

Introduction

Plantar fasciitis (PF) is one of the most common causes of heel pain which occurs because the plantar fascia becomes inflamed and creates pain at the inner heel area of the calcaneus bone. The plantar fascia is a fibrous band on the plantar surface of the foot that plays an essential role in weight bearing and in maintaining the medial longitudinal arch. Excessive mechanical loading causes fascia microtrauma which leads to degeneration and subsequent development of pain together with functional limitations.[1]

Plantar fasciitis affects approximately 10% of the general population with the highest prevalence occurring among people aged 40 to 60 years. Obesity has been consistently identified as a major risk factor for PF with studies reporting a 1.4 to 2.9 times higher incidence among individuals with elevated body mass index (BMI). Increased plantar loading together with excessive foot pronation and reduced shock absorption in obese individuals leads to greater strain on the plantar fascia which results in degenerative changes.[2]

Plantar fasciitis is primarily diagnosed through clinical assessment, characterized by heel pain during weight-bearing activities, with pronounced symptoms during the first steps taken in the morning. Ultrasonography (USG) serves as an important diagnostic tool because it enables medical professionals to measure plantar fascia thickness while observing structural changes in the tissue. Normal plantar fascia thickness is <4.0 mm whereas PF shows increased thickness with a hypoechoic appearance together with loss of the fibrillar pattern most commonly seen in obese patients.[3]

Conservative management remains the first-line treatment for PF, with more than 80–90% of patients responding favorably. Standard therapy includes weight reduction, aerobic exercise, plantar fascia stretching, and intrinsic foot muscle strengthening. Weight loss of 5–10% has been shown to produce clinically meaningful improvements in pain and function.[4]evidence-based guidelines to identify and treat obesity are available to primary care providers (PCPs Low-level laser therapy (LLLT) has emerged as a non-invasive modality with analgesic and anti-inflammatory effects through photobiomodulation. LLLT has demonstrated potential benefits in reducing pain and plantar fascia thickness in patients with PF, including those with obesity; however, optimal treatment protocols and its added value to standard therapy remain unclear.[3] Evidence regarding the effectiveness of LLLT in plantar fasciitis remains inconsistent, with some randomized controlled trials and systematic reviews reporting no significant superiority compared to placebo or other conservative treatments.[5] There is a lack of well-designed randomized controlled trials specifically targeting obese populations, who represent a high-risk group with distinct biomechanical and metabolic characteristics. Most existing studies have evaluated heterogeneous populations without stratifying for obesity status, limiting the generalizability of findings to this subgroup. Therefore, the additional benefit of LLLT when combined with standard therapy in obese patients with plantar fasciitis remains unclear.[5]

The study investigates the effectiveness of LLLT combined with standard treatment against standard treatment alone for treating plantar fasciitis in obese patients because obesity shows a strong link to plantar fasciitis and there is insufficient data on LLLT treatment results compared to standard care. The research study investigates three different results which include pain intensity measurement through visual analog scale (VAS) assessment and plantar fascia thickness measurement through ultrasonography and functional results which the research team evaluated using the Foot and Ankle Outcome Score (FAOS) assessment method.

Methods

The research was conducted using a single-blind randomized controlled clinical trial method at the Obesity Clinic of the Department of Physical Medicine and Rehabilitation at Faculty of Medicine Universitas Indonesia and Dr. Cipto Mangunkusumo National General Hospital in Jakarta from July 2019 until March 2021. The study included patients with plantar fasciitis and obesity aged 30 to 70 years, and consecutive sampling was used to enroll participants, who were then assigned to treatment and control groups using a computer-generated randomization sequence. The randomization sequence was created using a random number generator with a 1:1 allocation ratio. Allocation concealment was maintained using sequentially numbered, opaque, sealed envelopes prepared by an independent researcher not involved in the participant recruitment or assessment. This study employed a single-blind design in which outcome assessors were blinded to group allocation, while participants were aware of the intervention received. Participants and treating clinicians were not blinded due to the nature of the intervention.

The sample size was determined using a formula for comparing two independent means, assuming a two-sided significance level of 5% ($Z\alpha$=1.96) and statistical power of 80% ($Z\beta$=0.84). Parameters for standard deviation and expected mean difference were obtained from prior literature.[6] Based on the VAS outcome, with a standard deviation of 10.3 and an expected mean difference of 17, the minimum required sample size was 6 participants per group. After accounting for a 10% anticipated dropout rate, the final sample size was adjusted to 7 participants per group (total n=14).

The study included 14 subjects who m*et al*l inclusion and exclusion criteria, with 7 subjects assigned to each group. The treatment group received a combination of low-level laser therapy (LLLT) and standard therapy, whereas the control group received standard therapy alone. Standard therapy included nutritional counseling and aerobic exercise through ergocycle and plantar fascia stretching and intrinsic foot muscle strengthening exercises. Exercise intensity was maintained at 60–

70% of maximum heart rate. Ergocycle was pedaled at the speed of 50 RPM with a load of 0 KP with progressive duration of 15 minutes in week I, 30 minutes in week II, 45 minutes in week III and 60 minutes in week IV. Plantar fascia stretching and intrinsic foot muscle strengthening was done in three sessions, with 10 repetitions for 30 seconds and one minute of rest in between repetitions. Rolling ball stretches were performed for 5 minutes. Curb/stair stretches, leaning wall stretches, gastrocnemius stretching, and towel curls for 3 sets of 10 repetitions held for 30 seconds. The intervention program included three weekly sessions that lasted for four weeks.

LLLT was delivered using a class 3B laser device (Chattanooga Vectra Genisys Laser Controller) equipped with a cluster probe. The device provided a power output of 5 × 50 mW at a wavelength of 850 nm. Each treatment applied an energy density of 8 Joules per cm^2 for 3 minutes and 29 seconds. Therapy was administered three times per week for 4 weeks. LLLT was given to treat four plantar foot areas through the grinding technique. In this technique, the tip of the laser applicator is placed in light contact on skin and directed perpendicular to target or an adjusted duration of time. Treatment areas were divided into squares measuring $1cm^2$. Laser therapy was applied to each square centimeter with predetermined time and dose.

The study measured the results through three assessment tools which were the Visual Analogue Scale (VAS) and the Foot and Ankle Outcome Score (FAOS) and the measurement of plantar fascia thickness through musculoskeletal ultrasonography which occurred before and after the intervention. The researchers assessed VAS scores through weekly evaluations which continued throughout the entire treatment duration. The researchers used IBM SPSS Statistics version 23.0. Data normality was assessed using the Shapiro–Wilk test. Normally distributed data were expressed as mean ± standard deviation, while non-normally distributed data were presented as median with minimum and maximum values. Comparisons of VAS, plantar fascia thickness, and FAOS between the two groups were conducted using the independent t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. The researchers set statistical significance at $p < 0.05$. The research obtained ethical clearance from Health Research Ethics Committee Faculty of Medicine Universitas Indonesia under approval number NO.KET-555/UN2.F1/ETIK/PPM.00.02/2020 while all study participants signed written informed consent documents.

Result

The research was conducted at the Department of Physical Medicine and Rehabilitation at Dr. Cipto Mangunkusumo National General Hospital from July to November 2020. The study included obese patients with plantar fasciitis who fulfilled the study's eligibility criteria. Consecutive sampling was used to recruit study participants, who were then assigned to either treatment or control groups using simple randomization.

The research included a total of 14 participants which consisted of 11 female participants and 3 male participants. No significant differences were observed in baseline characteristics between the treatment and control groups, including age, sex, body mass index (BMI), education level, occupation, and pain location. Baseline characteristics are presented in Table 1.

VAS scores decreased progressively in both groups over the four-week intervention period (Table 2).

Analysis of changes in VAS scores (delta values) demonstrates statistically significant differences between the two groups at Week 2 (p=0.009) and Week 4 (p=0.04), as shown in Table 3. Both groups showed progressive reductions in pain; however, greater improvements were observed in the treatment group. At week 2, the reduction in VAS score was significantly greater in the treatment group compared to the control group (mean difference 1.3 points, p=0.009). Similarly, at week 4, the treatment group demonstrated a significantly greater reduction (mean difference 1.1 points, p=0.04). No statistically significant differences between groups were observed at week 1 (mean difference 0.3, p=0.26) or week 3 (mean difference 0.6, p= 0.29).

The mean baseline plantar fascia thickness is 5 ± 1 mm in the control group and 5.8 ± 0.8 mm in the treatment group. After four weeks, the control group shows minimal change, whereas the treatment group demonstrated a greater reduction in plantar fascia thickness. The difference in thickness reduction between groups was statistically significant (p=0.01), as shown in Table 4.

FAOS scores in all domains increased in both groups after four weeks of intervention. No significant differences were found in the

Table 1 Baseline Characteristics of Study Subjects

Characteristics	Groups	
	Control (n=7)	Treatment (n=7)
	Mean ± SD	Mean ± SD
Age	45.14 ± 11.37	51.71 ± 10.85
Age Category		
<60	7 (100%)	6 (85.7%)
≥60	-	1 (14.3 %)
Gender		
Female	5 (71.4 %)	6(85.7 %)
Male	2 (28.6 %)	1 (14.3 %)
BMI	30.20 ± 5.86	30.08 ± 3.77
Obesity I	4 (57.1 %)	4 (57.1 %)
Obesity II	3 (42.9 %)	3 (42.9 %)
Pain Side		
Right	2 (28.6 %)	5 (71.4 %)
Left	5 (71.4 %)	2 (28.6 %)
Education		
Diploma	1 (14.3%)	1 (14.3 %)
Bachelor	6 (85.7%)	6 (85.7 %)
Jobs		
Nurse	4 (57.1%)	6 (85.7%)
Doctor	3 (42.9%)	-
Housewife		1 (14.3%)
Plantar fascia thickness	0.50 ± 0.10	0.58 ± 0.08
VAS	4.80 ± 0.69	5.80 ± 1.06
FAOS		
Symptom	52.04±11.81	44.61±6.19
Pain	64.07±11.56	49.60±14.82
ADL	75.69±20.81	55.88±15.42
Sport and Recreation	73.57±11.44	47.17±17.99
Quality of life	60.71±12.86	43.75±13.01

Abbreviations: SD = Standard Deviation; BMI = Body Mass Index; VAS = Visual Analogue Scale; FAOS = Foot and Ankle Outcome Score; ADL = Activities of Daily Living

symptom, pain, activities of daily living, sport and recreation, or quality of life domains, although an overall trend toward improvement is observed in the treatment group (Table 5).

Discussion

This study involved 14 subjects who met the minimum required sample size. Data collection was conducted over a five-month period, from July to November 2020. The control group and the intervention group both received standard therapy which included nutritional management and aerobic exercise and plantar fascia stretching and intrinsic foot muscle strengthening exercises during the study period.

Table 2 Visual Analogue Scale Scores After Intervention

VAS	Group	
	Control	Treatment
Week 0	4.8 ± 0.69	5.8 ± 1.06
Week 1	4.0 ± 0.80	5.2 ± 1.11
Week 2	3.7 ± 0.75	3.4 ± 1.20
Week 3	2.2 ± 0.75	2.7 ± 1.10
Week 4	1.7 ± 0.75	1.5 ± 1.10

Note: Data presented as mean ± SD; Abbreviations: VAS = Visual Analogue Scale

The standard therapy provided is consistent with obesity management principles which emphasize reducing energy intake and increasing energy expenditure through dietary modification and increased physical activity and lifestyle changes. The research team selected stationary bicycle aerobic exercise because it generates lower compressive forces which make the exercise safer for obese patients. The exercise program began at 60–70% of maximum heart rate and progressed gradually through weekly increases until the target exercise duration was achieved. Additionally, adherence to exercise and variability in weight reduction were not quantitatively controlled, introducing potential performance bias.

Table 3 Changes in Visual Analogue Scale Scores (Delta)

VAS	Group				Mean Difference	p-value	95% CI
	Control		Treatment				
	Mean	Median (min-max)	Mean	Median (min-max)			
Delta 1 (1-0)	0.8±0.37	1 (0-1)	0.5±0.97	0 (0-2)	0.3	0.26*	0.5 – 1.2
Delta 2 (2-0)	1.1±0.37	1 (1-2)	2.4±0.97	2 (1-4)	1.3	0.009*	0.8 – 1.5
Delta 3 (3-0)	2.5±0.78	3 (1-3)	3.1±0.89	3 (2-5)	0.6	0.29*	1.8 – 3.3
Delta 4 (4-0)	3.1±0.69	3 (2-4)	4.2±1.1	2 (3-6)	1.1	0.04**	2.5 – 3.8

*Mann-Whitney; **Independent T-test; Abbreviations: VAS = Visual Analogue Scale; min = minimum; max = maximum; CI = Confidence Interval

The program includes plantar fascia and Achilles tendon stretching exercises because both structures belong to the superficial back line which functions as a key component for walking and running movements. Stretching and strengthening of the intrinsic foot muscles have been shown to reduce pain in plantar fasciitis (PF) and improve foot stability during functional activities. These findings are consistent with systematic reviews by Latey *et al*. and Dean Huffer *et al*., which reported that a combination of plantar fascia stretching and intrinsic foot muscle strengthening particularly using towel curl exercises resulted in significant improvements in pain and foot function as measured by the Visual Analog Scale (VAS) and the Foot and Ankle Outcome Score (FAOS).[7,8] Pfeffer *et al*. also reported that 72% of PF patients who performed stretching exercises for eight weeks experienced significant symptom improvement.[7]

Therapeutic exercise plays a major role as a modulator of muscle plasticity. Wahl *et al*. stated that physical exercise can improve

Table 4 Changes in Plantar Fascia Thickness

	Control			Treatment			p-value*	95% CI
	Pre	Post	Delta	Pre	Post	Delta		
Thickness of the plantar fascia (mm)	5 ± 1	5 ± 0.58	0.1 ± 0.6	5.8±0.8	4.6±1.3	1.1 ± 0.6	0.01	-1.9-- 0.3

*Independent T-test; Abbreviations: pre = pre-intervention; post = post-intervention; CI = Confidence Interval

Table 5 Comparison of FAOS Scores Between Control and Treatment Groups

Variable	Control			Treatment			p-value*	95% CI
	Pre	Post	Delta	Pre	Post	Delta		
Symptoms	52.04 ± 11.8	64.71 ± 4.88	12.67 ± 10.65	44.61 ± 6.19	62.80 ± 8.98	18.19 ± 10.38	0.34	-17.77 – 6.73
Pain	64.07 ± 11.56	84.52 ± 9.05	20.44 ± 6.52	49.60 ± 14.82	88.09 ± 6.74	38.49 ± 12.04	0.84	-25.03 – 20.57
Activities of Daily Living	75.69 ± 20.8	93.90 ± 3.74	18.27 ± 17.50	55.88 ± 15.42	77.85 ± 13.49	25.63 ± 23.63	0.52	-31.57 – 16.86
Sports and Recreation	73.57 ± 11.44	87.14 ± 4.87	13.57 ± 10.69	47.17 ± 17.99	77.85 ± 13.49	30.71 ± 26.68	0.14	-40.81 – 6.53
Quality of Life	60.71 ± 12.86	75.89 ± 4.31	15.17 ± 12.93	43.75 ± 13.01	66.96 ± 18.99	23.21 ± 22.74	0.43	-29.58 – 13.51

*Independent T-test; Abbreviations: pre = pre-intervention; post = post-intervention; CI = Confidence Interval

skeletal muscle function and regeneration through increased growth factor expression, myoblast activation, and tissue regeneration.[9] In addition, reductions in fat mass resulting from aerobic exercise contribute to decreased body mass index (BMI), reduced mechanical loading on the feet, and decreased tension on the plantar fascia, thereby reducing inflammation and pain.[9]

Plantar fasciitis most commonly occurs in individuals aged 40–60 years, particularly in women and obese individuals.[10,11] The mean age of subjects in this study falls within this range, which is consistent with the previously reported epidemiology of PF. The predominance of female subjects in this study also aligns with several studies reporting a higher prevalence of PF in women. Most subjects had a higher level of education, which has been shown to correlate with better adherence to therapeutic and exercise programs.[12]

Obesity is a major risk factor for PF, as increased BMI leads to greater mechanical loading on the feet, a reduction in the medial longitudinal arch, and increased tension on the plantar fascia. These findings are consistent with a study by Andrew *et al*., which reported that obesity contributes up to 70% of the risk for PF.[4] Furthermore, the majority of subjects worked as healthcare professionals who are required to stand and walk for prolonged periods on hard surfaces, potentially increasing the risk of repetitive microtrauma to the plantar fascia.[13,14]

Heel pain is the primary symptom of PF and is often most pronounced during the first steps in the morning. Low Level Laser Therapy (LLLT) exerts its effects through photo biomodulation mechanisms, providing non-thermal and anti-inflammatory effects on tissues. In this study, LLLT at a dose of 8 J/cm^2 was administered in 12 sessions over four weeks. A reduction in VAS scores is observed in both groups; however, a significantly greater reduction was found in the intervention group, with statistically significant differences at weeks 2 and 4. Importantly, the observed reduction in VAS scores exceeded the minimal clinically important difference (MCID), suggesting that the improvements were not only statistically significant but also clinically meaningful.[15]

The findings of this study are consistent with a meta-analysis by Wang *et al*., which concluded that LLLT significantly reduced PF-related pain in both short-term evaluations and three-month follow-up assessments.[5,16] Studies by Ulusoy *et al*. and Jastifer *et al*. also reported significant reductions in VAS scores following LLLT.[17] Variability in outcomes among LLLT studies is thought to be related to differences in dosage and treatment protocols. Basford *et al*. reported no significant pain improvement with doses lower than those recommended by the World Association for Laser Therapy (WALT), highlighting the importance of appropriate dose selection.[15]

Plantar fasciitis is characterized by repetitive microtrauma leading to collagen degeneration and thickening of the plantar fascia.[18] In this study, plantar fascia thickness in the intervention group decreased significantly following LLLT intervention, whereas no significant change was observed in the control group. These findings are consistent with a study by Mahowald *et al*., which reported that reductions in plantar fascia thickness correlate with pain reduction. Similar results have also been reported in previous studies using ultrasonography and Magnetic Resonance Imaging (MRI) modalities.[3,17]

The FAOS was used to assess pain, symptoms, activities of daily living, sports and recreational activities, and foot-related quality of life.[19] In this study, improvements in FAOS scores were observed across all domains in both groups; however, other domains showed trends toward improvement without reaching statistical significance. These findings are consistent with studies by Federico *et al*. and Ferit *et al*.[20,21] The lack of statistical significance in several domains may be multifactorial; although reduced physical activity during the COVID-19 period is a possible explanation, which was not formally measured in this study.[21,22]

No adverse effects related to LLLT are observed during the study. This finding supports previous evidence indicating that LLLT is a safe, non-invasive therapeutic modality with minimal risk of side effects. LLLT may be considered as an adjunct modality within a multimodal rehabilitation program, particularly for patients who do not achieve adequate relief with standard conservative management alone.

Compared to LLLT, Extracorporeal shock wave therapy (ESWT) has been widely used in the management of plantar fasciitis and has demonstrated consistent clinical benefits. However, recent evidence suggests that its superiority over laser-based therapies remains unclear. Alotaibi *et al*. reported no significant differences in pain reduction or functional outcomes between LLLT high-intensity laser therapy, and ESWT. Therefore, LLLT may be considered a comparable non-invasive option and is best positioned as part of a multimodal rehabilitation approach rather than a standalone superior therapy.[23]

The study has limitations which include its short intervention period and lack of long-term follow-up and the possibility that COVID-19 pandemic affected participants' physical activity and psychological status. The study results demonstrate clinically relevant evidence which supports using LLLT as an additional treatment for obese patients who have plantar fasciitis.

This study is the first in Indonesia to evaluate the effectiveness of low-level laser therapy (LLLT) in obese patients with plantar fasciitis using a single-blind randomized clinical trial design. Four weeks of adjunctive LLLT treatment showed greater benefits than standard therapy for reducing pain intensity (VAS) and decreasing plantar fascia thickness and improving FAOS pain scores. However, these findings should be interpreted with caution due to the small sample size. Multiple comparisons were performed across secondary outcomes without formal adjustment; therefore, these findings should be interpreted with caution due to the potential risk of Type I error. Larger randomized controlled trials are needed to confirm these results.

References

1. Schuitema D, Greve C, Postema K, Dekker R, Hijmans JM. Effectiveness of mechanical treatment for plantar fasciitis: a systematic review. J Sport Rehabil. 2020;29(5):657–74. doi:10.1123/jsr.2019-0036.
2. Walsh TP, Arnold JB, Evans AM, Yaxley A, Damarell RA, Shanahan EM. The association between body fat and musculoskeletal pain: a systematic review and meta-analysis. BMC Musculoskelet Disord. 2018;19(1):233. doi:10.1186/s12891-018-2137-0.
3. Ordahan B, Karahan AY, Kaydok E. The effect of high-intensity versus low-level laser therapy in the management of plantar fasciitis: a randomized clinical trial. Lasers Med Sci. 2018;33(6):1363–9. doi:10.1007/s10103-018-2497-6.
4. Hagemann LA. The implementation gap between evidence-based guidelines and primary care providers' provision of care for adult obese individuals. Las Vegas (NV): University of Nevada, Las Vegas; 2017. doi:10.34917/10985920.
5. Wang W, Jiang W, Tang C, Zhang X, Xiang J. Clinical efficacy of low-level laser therapy in plantar fasciitis: a systematic review and meta-analysis. Medicine (Baltimore). 2019;98(3):e14088. doi:10.1097/MD.0000000000014088.

6. American Geriatrics Society Panel on Exercise and Osteoarthritis. Exercise prescription for older adults with osteoarthritis pain: consensus practice recommendations. A supplement to the AGS Clinical Practice Guidelines on the management of chronic pain in older adults. J Am Geriatr Soc. 2001;49(6):808–23. doi:10.1046/j.1532-5415.2001.00496.x.
7. Siriphorn A, Eksakulkla S. Calf stretching and plantar fascia-specific stretching for plantar fasciitis: a systematic review and meta-analysis. J Bodyw Mov Ther. 2020;24(4):222–32. doi:10.1016/j.jbmt.2020.06.013.
8. Neri SGR, Harvey LA, Tiedemann A, Gadelha AB, Lima RM. Obesity and falls in older women: mediating effects of muscle quality, foot loads and postural control. Gait Posture. 2020;77:138–43. doi:10.1016/j.gaitpost.2020.01.025.
9. Huffer D, Hing W, Newton R, Clair M. Strength training for plantar fasciitis and the intrinsic foot musculature: a systematic review. Phys Ther Sport. 2017;24:44–52. doi:10.1016/j.ptsp.2016.08.008.
10. Buchanan BK, Sina RE, Kushner D. Plantar fasciitis. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
11. Granado MJ, Lohman EB, Daher NS, Gordon KE. Effect of gender, toe extension position, and plantar fasciitis on plantar fascia thickness. Foot Ankle Int. 2019;40(4):439–46. doi:10.1177/1071100718811631.
12. Ganasegeran K, Rajendran AK, Al-Dubai SAR. Psycho-socioeconomic factors affecting complementary and alternative medicine use among selected rural communities in Malaysia: a cross-sectional study. PLoS One. 2014;9(11):e112124. doi:10.1371/journal.pone.0112124.
13. Chappel SE, Verswijveren SJJM, Aisbett B, Considine J, Ridgers ND. Nurses' occupational physical activity levels: a systematic review. Int J Nurs Stud. 2017;73:52–62. doi:10.1016/j.ijnurstu.2017.05.006.
14. Sung KC, Chung JY, Feng IJ, Yang SH, Hsu CC, Lin HJ, *et al*. Plantar fasciitis in physicians and nurses: a nationwide population-based study. Ind Health. 2020;58(2):153–60. doi:10.2486/indhealth.2019-0069.
15. Yin MC, Yan YJ, Tong ZY, Xu CQ, Qiao JJ, Zhou XN, *et al*. Development and validation of a novel scoring system for severity of plantar fasciitis. Orthop Surg. 2020;12(6):1882–9. doi:10.1111/os.12827.
16. Mansouri V, Arjmand B, Rezaei-Tavirani M, Razzaghi M, Rostami-Nejad M, Hamdieh M. Evaluation of efficacy of low-level laser therapy. J Lasers Med Sci. 2020;11(4):369–80. doi:10.34172/jlms.2020.60.
17. Ulusoy A, Cerrahoglu L, Orguc S. Magnetic resonance imaging and clinical outcomes of laser therapy, ultrasound therapy, and extracorporeal shock wave therapy for treatment of plantar fasciitis: a randomized controlled trial. J Foot Ankle Surg. 2017;56(4):762–7. doi:10.1053/j.jfas.2017.02.013.
18. Bas D, Martin M, Pollack C, Venne R. The impact of COVID-19 on sport, physical activity and well-being and its effects on social development. UN DESA Policy Brief No. 73. New York: United Nations; 2020. doi:10.18356/a606a7b1-en.
19. Clijsen R, Brunner A, Barbero M, Clarys P, Taeymans J. Effects of low-level laser therapy on pain in patients with musculoskeletal disorders: a systematic review and meta-analysis. Eur J Phys Rehabil Med. 2017;53(4):603–10. doi:10.23736/S1973-9087.17.04432-X.
20. Giordani F, Bernini A, Müller-Ehrenberg H, Stecco C, Masiero S. A global approach for plantar fasciitis with extracorporeal shockwaves treatment. Eur J Transl Myol. 2019;29(3):8372. doi:10.4081/ejtm.2019.8372.
21. Akkurt F, Akkurt HE, Yılmaz H, Olgun Y, Sen Z. Efficacy of high-intensity laser therapy and silicone insole in plantar fasciitis. Int J Phys Med Rehabil. 2018;6(5):484. doi:10.4172/2329-9096.1000484.
22. Nurhidayati, Anam AK, editors. Manajemen bisnis di era pandemi COVID-19 & new normal. Semarang: Unissula Press; 2020.
23. Alotaibi MN, Alharran AM, Alasmari OY, Mohammad MA, Mohammad FA, Alahmad AA, *et al*. Comparison of laser therapy and extracorporeal shock wave therapy in the treatment of patients with plantar fasciitis: a systematic review and meta-analysis of prospective studies. Lasers Med Sci. 2026;41(1):29. doi:10.1007/s10103-026-04824-5.