


ORIGINAL RESEARCH ARTICLE

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# Prevalence, causes, and treatment of plantar fasciitis in young females of a medical college

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## Abstract

**Background** Plantar fasciitis, a common musculoskeletal disorder, is characterized by inflammation of the plantar fascia, a thick band of tissue that connects the heel bone to the toes. The plantar fascia plays a crucial role in supporting the arch of the foot and absorbing shock during movement. Factors such as excessive physical activity, improper footwear, and biomechanical abnormalities are recognized contributors to the development of plantar fasciitis. However, the prevalence and underlying causes may vary across different demographic groups, necessitating targeted investigations.

**Objective** This study aims to investigate the prevalence, causes and treatment of plantar fasciitis in young female students (18–30) of a medical college in Pakistan and explore potential associations with high-heel footwear.

**Methodology** In this study, a cross-sectional survey was carried out, engaging 100 young females from a medical college. Employing a structured questionnaire, we assessed a spectrum of parameters, including heel pain symptoms, footwear habits, and available treatment options. The diagnostic precision of the Windlass test, specific to plantar fasciitis, was incorporated. Rigorous data analysis, utilizing SPSS, centered on discerning associations between the nuances of high-heel wear (considering types and duration) and the reported symptoms. This methodological framework ensures a comprehensive and precise exploration of the prevalence, causes, and treatment of plantar fasciitis in our targeted demographic.

**Results** All the participants were female, and the total number was 100, of which 66% felt pain in the heel when they wore high heels. Out of this 66%, only 6% are diagnosed with plantar fasciitis. The rest of the 60% have pain in the heel due to different causes such as heel spurs, stress fractures, etc. 2% of people receive treatment with steroid injections, and 12% are treated with ice.

**Conclusion** We conclude that the prevalence of plantar fasciitis is high in females wearing high heels. This study reveals that an increase in the total duration of wearing high heels with hard soles increases the symptoms of plantar fasciitis. Plantar fasciitis can be prevented by education and applying ergonomics and could be treated by steroids and the ice method, according to medical practitioners.

**Keywords** Planter fasciitis, Heel pain, Prevalence, Windless test

## Introduction

One of the most prevalent soft tissue conditions of the foot is plantar fasciitis. It involves inflammation and degeneration of the plantar fascia origin [1]. Plantar fasciitis is more common in people whose ankle dorsiflexion range is reduced, who spend most of the day standing up, and whose body mass index is greater than 30 kg/m<sup>2</sup> [2]. Plantar fasciitis is referred to by several names, such as

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jogger's heel, tennis heel, policeman's heel, and even gonorrhoeal heel. The general population occasionally refers to this condition as heel spurs, despite the fact that this is incorrect [2].

Plantar fasciitis affects two million people in the US and results in one million outpatient visits each year [3]. Plantar fasciitis had an overall unadjusted incidence rate of 10.5 per 1000 person-years [4]. Women exhibited a considerably higher adjusted incidence rate ratio for plantar fasciitis of 1.96 when compared to males (95% confidence interval, 1.94 to 1.99) [5]. When comparing black service members to white service members, the adjusted incidence rate ratio was 1.12 (95% confidence interval, 1.09 to 1.12) [6]. Although it has been reported that men are more likely to develop plantar fasciitis, this may simply be due to their profession or leisure activities [7]. The other substantial series demonstrate an equal distribution of the sexes [8]. In Springfield, Massachusetts, 784 community-dwelling persons aged 65 or more were included in a community-based, multi-ethnic (non-Hispanic White, African American, and Puerto Rican) random sample to investigate the prevalence of foot and ankle problems [9]. In the general population, adults between the ages of 40 and 60 are more likely to develop plantar fasciitis than younger people who run [10].

It is unclear what causes plantar fasciitis. According to Barrett and O'Malley (1999), it is typically brought on by a biomechanical imbalance that causes tension along the plantar fascia [11]. Because limited ankle dorsiflexion of the foot might stretch the plantar fascia, tightness of the Achilles tendon will predispose to plantar fasciitis [12]. Your plantar fascia normally supports the arch of your foot by acting like a shock-absorbing bowstring. It is possible for the fascia to develop minor rips if the strain and tension on the bowstring become excessive [13]. Although the origin of plantar fasciitis is sometimes unclear, repetitive straining and tearing can irritate or inflame the fascia [14].

The inferior heel region's pain and discomfort are the most typical plantar fasciitis symptoms, and they are made worse by weight-bearing after a period of not doing so [15]. When getting out of bed in the morning, patients frequently report experiencing excruciating pain that gradually goes away during the following 30–45 min [16]. If the patients have a lengthy journey to work, they may also remark that while they did not experience any pain while driving, it started as soon as they tried to bear weight again on the affected extremity [17]. Once at work, the patient could be able to engage in a variety of activities for 3–4 h prior to the onset of their heel discomfort, depending on whether their line of work necessitates sitting or prolonged periods of weight-bearing throughout the day [18]. Patients frequently describe discomfort over

the medial, lateral, and lower posterior regions of the calcaneus and the inferior heel region, however, the location of heel pain might vary [19]. On rare occasions, the patient may additionally express discomfort in the area of the medial longitudinal arch over the plantar fascia's central band [18]. Generally speaking, pain is more intense during weight-bearing activities, and before the onset of symptoms, the patient has changed either the amount or intensity of their physical activity [20].

Limiting ankle dorsiflexion while extending the knee is the key risk factor for plantar fasciitis [2]. Plantar fasciitis can be brought on by middle age and biomechanical issues with the foot, such as tight Achilles tendons, pes cavus, and pes planus [21]. Plantar fasciitis risk factors include obesity, which affects 70% of people, increased BMI in the non-athletic population, and time spent weight-bearing, such as prolonged standing as that required of police wardens and security guards on hard surfaces [2]. Young women who wear high heels, which put additional strain on the plantar fascia, have been linked to rupturing the fascia [21]. Although plantar fasciitis can occur for no apparent reason, the following variables can raise your risk of getting it like age, specific forms of exercise, foot movement, obesity etc.

Rest, stretching, strengthening, switching shoes, arch supports, orthotics, night splints, and anti-inflammatory medications are all used in the treatment of plantar fasciitis. Usually, plantar fasciitis can be successfully treated by adjusting the course of action to a patient's risk factors and preferences [22]. Premade shoe inserts are more likely than custom polypropylene orthotics to result in symptom improvement when used in conjunction with a stretching regimen for the first treatment of proximal plantar fasciitis [23]. Both the injection of corticosteroids and the use of tenoxicam are beneficial in treating plantar fasciitis, but corticosteroid injection is more successful. Tenoxicam can, however, reduce plantar fasciitis discomfort [1]. Patients who don't improve after receiving conservative care are the only ones who receive surgical surgery [24]. A medial longitudinal incision is used to conduct a full plantar fascia release. Resection is performed on the plantar fascia and prominent heel spurs [1].

According to the medical practitioners, plantar fasciitis has been treated with both surgical and nonsurgical methods. Reduce pain and inflammation, reduce tissue stress to a manageable level, and restore muscular strength and flexibility of implicated tissues [25].

#### Literature review

At the mobile hospital in Saudi Arabia, Mir. Sadat Ali conducted study on the prevalence of plantar fasciitis among security forces personnel. An orthopaedic clinic

received 103 patients who complained of heel pain. The body mass index was 30.36 kg/m<sup>2</sup>, and the average age was 38.1 years. He discovered that 1.18 percent of aching heels were attributable to plantar fasciitis. According to the study, plantar fasciitis is caused by obesity and is made worse by wearing the wrong shoes [26].

The prevalence of plantar fasciitis in the US military was studied by Scher, Belmont Jr. They discovered that plantar fasciitis had a 10.5 per 1000 person-year annual unadjusted incidence rate. Women experienced a higher adjusted rate of plantar fasciitis than males did, which was 1.96 (95% confidence interval: 1.94 to 1.99). When comparing black service members to white service members, the adjusted incidence ratio was 1.12 (95% confidence interval: 1.09 to 1.12). The adjusted incidence rate ratio for plantar fasciitis increased considerably among the officer rank categories [6].

According to studies by Damien B. Irving, pronated feet and obesity both raise the likelihood of chronic plantar heel discomfort. The goal of their investigation was to determine what causes CPHP. They selected 80 CPHP participants whose ages were matched. The body mass index (BMI), foot posture (FPI), and range of motion (ROM) of the ankle dorsiflexion (Dorsiflexion Lunge) were then compared between the two groups. They assessed that the CPHP group had substantially greater BMI ( $29.8 \pm 5.4$  kg/m<sup>2</sup> vs.  $27.5 \pm 4.9$  kg/m<sup>2</sup>;  $P < 0.01$ ), a more pronated foot posture (FPI score  $2.4 \pm 3.3$  vs.  $1.1 \pm 2.3$ ;  $P < 0.01$ ) and greater ankle dorsiflexion ROM ( $45.1 \pm 7.1^\circ$  vs.  $40.5 \pm 6.6^\circ$ ;  $P < 0.01$ ) than the control group [27].

The research was conducted on the risk factor for plantar fasciitis by Robert A. Werner. Determining the proportional contributions of work activity was his main objective. On physical examination, high metatarsal pressure, more time spent walking, more time standing on hard surfaces, and forefoot pronation all raised the incidence of plantar fasciitis, according to his findings. Plantar fasciitis risk was found to decrease with shoe rotation during the work week. He claims that both primary and secondary preventative techniques could be employed [28].

Research on plantar fasciitis' prevalence and medical management in the adult population of the United States was published by Nahin, R. L. He discovered that 85% of the sample said they had just been diagnosed with plantar fasciitis. He claimed that the prevalence of plantar fasciitis was higher in women (1.19%) than in males (0.47%), in people 45 to 64 years old (1.33%) than in people 18 to 44 years old (0.53%; referent), and in obese people (1.48%) than in people with a body mass below 25 (0.29%; referent). He claimed that the most

widely utilized prescription medications for plantar fasciitis were NSAIDs [20].

Research on musculoskeletal injuries caused by running was conducted by Alexandre Dias Lopes. Finding the incidence and prevalence of RRMI is the goal of his investigation. He discovered 28 RRMI with a prevalence of 5.2% to 7.5% and an incidence of plantar fasciitis ranging from 4.5% to 10% [29].

Hechmi Toumi conducted study on the prevalence of plantar and Achilles spurs in relation to age groups, with sex being a variable factor. Only a third of the population (11%) had spurs at both sites (Achilles and plantar), while 38% of the population overall had a spur (Achilles or plantar). In people who were older (40 to 79 years old), large spurs were more common. In people under 40, there were no significant plantar spurs, and there were only 2% Achilles spurs. Women were more likely than men to develop plantar and Achilles spurs in people under the age of 50. For women under 30 years old, there was a noticeable moderately favorable association ( $r = 0.71$ ) between both plantar and Achilles spurs, whereas there was no link for men ( $r = -0.03$ ).

## Methodology

One hundred voluntary female participants were taken from sargodha medical college and were asked to fill out a questionnaire. They were given introduction about our study and information about plantar fasciitis as well.

The participant's written consent was taken before participating in the data collection and they were assured of the confidentiality of their data. This was a questionnaire-based study so there were no risks associated with the study.

## Study design

This research followed an observational cross-sectional survey design, allowing for a comprehensive snapshot of the prevalence and factors associated with plantar fasciitis in this specific demographic.

## Sample size

A carefully chosen sample of 100 young females, representative of the medical college population, contributed to the robustness of the study.

## Sampling technique

Convenience probability sampling was employed, acknowledging the practical constraints of participant selection within the medical college context.

**Setting**

The study took place within the dynamic and unique academic environment of Sargodha Medical College, ensuring relevance to the experiences of the participants.

**Inclusion criteria**

Enrolled participants were females aged between 18 and 30 years, acknowledging the demographic specificity crucial for the investigation.

**Ethical considerations**

Adhering to rigorous ethical standards, the study prioritized participant well-being, ensuring the avoidance of any physical, social, or psychological harm. The research maintained strict compliance with established medical ethics guidelines.

**Rationale**

This research aimed to offer a comprehensive understanding of plantar fasciitis among young females in a medical college. By delving into the prevalence, causes, and treatment, the study sought to contribute valuable insights that could inform preventive strategies and treatment protocols for this unique demographic.

**Statistical analysis**

All the data was demonstrated as Mean and percentage. Data was analyzed using SPSS (Statistical package for social sciences) and expressed in the form of chart (Table 1).

**Data analysis**

**Frequencies**

All the participants were female, and the total number is 100, of which 66% reported pain in the heel and 34% had no pain.

**When do you feel pain?**

27% of participants felt pain with high-heeled shoes, 6% with flat shoes, 30% with hard-soled shoes, and 37% with no specific cause.

**Where is your heel pain?**

35% had pain underneath the heel, 2% under the arch, 26% under the heel and arch, and 36% with no specific location.

**Did you get a diagnosis for your heel pain?**

6% had a diagnosis of plantar fasciitis and 3% have a diagnosis of heel spur; 91% of participants with heel pain have no specific diagnosis.

**Table 1** Frequency chart

Question	Frequency
Feel pain in the heel	66%
No pain in the heel	34%
Feel pain with high-heeled shoes	27%
Feel pain with flat shoes	6%
Feel pain with hard-soled shoes	30%
Feel pain with no specific cause	37%
Pain location underneath the heel	35%
Pain location under the arch	2%
Pain location under the heel and arch	26%
No specific location of pain	36%
Diagnosed with plantar fasciitis	6%
Diagnosed with heel spur	3%
No specific diagnosis	91%
Pain severity: Mild	60%
Pain severity: Moderate	25%
Pain severity: Severe	15%
Problems performing usual activities	41%
Some problems performing usual activities	21%
Unable to perform usual activities	2%
High activity in daily life	7%
Moderate activity in daily life	70%
Low activity in daily life	23%
Self-diagnosed	39%
Clinically diagnosed	3%
Diagnosed by X-ray	1%
Diagnosed by ultrasound	4%
No diagnosis	53%
Seen a general practitioner for treatment	4%
Seen an orthopaedic surgeon for treatment	2%
Seen a physiotherapist for treatment	11%
Seen a sports medicine doctor for treatment	1%
No treatment received	82%
Duration of pain in days	42%
Duration of pain in weeks	19%
Duration of pain in months	4%
Duration of pain in years	2%
Received treatment with steroid injections	2%
Received treatment with ice	12%
No treatment received	86%

**How does your pain affect your normal activities/sports?**

41% had no problem performing usual activities, 21% had some problems performing usual activities, and 2% were unable to perform usual activities.

**What is your level of activity in routine life?**

7% of the cases had high activity in daily life, 70% had moderate activity, and 23% had low activity.

**How was your diagnose made?**

39% of cases were diagnosed by themselves; 3% had a clinical diagnosis, 1% by X-ray, 4% by ultrasound, and 53% had no diagnosis.

**What healthcare practitioners have you seen?**

4% of cases had consulted a general practitioner for treatment, 2% went to an orthopaedic surgeon, 11% had sessions with a physiotherapist, 1% chose a sports medicine doctor, and 82% did not consult anyone.

**How long have you had your problem?**

42% of cases had a duration of pain in days, 19% had a duration of pain in weeks, 4% reported a duration of pain in months, and 2% had a duration in years.

**Select the treatment you have had?**

2% received treatment with steroid injections, 12% received treatment with ice, and 86% didn't receive any kind of treatment.

**Discussion**

The study aimed to investigate the prevalence of plantar fasciitis among young women, exploring key indicators, symptoms, and contributing factors. The impact of wearing high-heeled shoe, daily walking duration, and the correlation between extended standing and plantar fasciitis revealed significant associations. Findings from a random probability sample underscored the notable link between high heels and the occurrence of plantar fasciitis.

The data demonstrated a correlation between the extended use of shoes with firm soles or high heels and an increased likelihood of developing plantar fasciitis. This is a similar finding to a study conducted by Wang et al. [30]. They found that increasing heel height increased strain placed on the plantar fascia.

A study conducted by Aiman et al. in 2022 demonstrated the effects of activity and work life on the severity of the symptoms in working ladies [31]. Prolonged standing, often associated with certain professions, emerged as a potential risk factor. We also saw that the physically active women had a higher percentage of having heel pain with increased severity of symptoms and duration. This is also indicated in the increased number of females who faced problems while doing daily activities due to this heel pain.

A study by Patricia et al. in 2018 explored the correlation of plantar fasciitis on quality of life and level of physical activity [32]. Her study found that the quality of life and the ability to perform daily life tasks were significantly affected by plantar fasciitis in females. Our study also establishes the same link and around 60%

females with plantar fasciitis reported that they faced difficulty while performing their daily life activities.

Young et al. in 2001 discussed the major non-surgical interventions for plantar fasciitis including icing, anti-inflammatory medications, corticosteroid injections and modifications to the shoes [33]. In our population, we saw that icing techniques were being implemented by majority of the women experiencing heel pain and some of them had corticosteroid injection therapy too. But the absence of other non-surgical treatments like using splints, medications and alterations in the shoes along with a majority of the females not undergoing any treatment shows that this important cause of their pain which has implications in affecting their daily life activities in being ignored.

We suggest that preventive measures should be implemented for heel pain. This must include emphasizing the importance of changing footwear and raising awareness in the population to reduce the prevalence of plantar fasciitis. Another thing that must be encouraged is to visit a qualified person for your pain and implementation of non-surgical treatment techniques.

While providing significant insights, the study has limitations, including its focus on a smaller population and the absence of diagnostic imaging. Future research could explore a broader demographic, incorporate imaging techniques, and delve deeper into the biomechanical aspects of plantar fasciitis development.

**Conclusion**

We conclude that the prevalence of plantar fasciitis is high in females wearing high heels. This study reveals that an increase in the total duration of wearing high heels with hard soles increases the symptoms of plantar fasciitis. The presence of swelling and inflammation are the main symptoms of plantar fasciitis. Rest, stretching, strengthening, switching shoes, arch supports, orthotics, night splints, and anti-inflammatory medications are all used in the treatment of plantar fasciitis, but steroid injections have the best effects on their treatment.

**Recommendations**

- Awareness about disease and prevention.
- Ergonomically designed shoes
  - less use of high heels
  - use of soft-soled shoes
- Strengthening of the arch muscles.
- Lose weight. If you're overweight or obese, you may put more pressure on the bottom of your feet. That pressure can lead to plantar fasciitis.



## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43161-024-00195-6>.

### Supplementary Material 1.

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#### Authors' contributions

1 and 2 wrote the literature review. 1 and 3 wrote the manuscript with support from 2. 1 carried out the data collection. 2 helped supervise the project. 1 and 2 conceived the original idea. 2 supervised the project.

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#### Availability of data and materials

Data is available on reasonable demand.

#### Declarations

#### Consent for publication

Authors gave the consent to publish my research paper.

#### Competing interests

There are no competing interests.

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