



RESEARCH ARTICLE

Association of Footwear Characteristics with Plantar Fasciitis among Adults Attending a Tertiary Care Hospital in Western Odisha

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ABSTRACT

Background: Plantar fasciitis is one of the most common causes of chronic heel pain among adults and significantly affects mobility and quality of life. Mechanical overload of the plantar fascia due to prolonged standing, obesity, and inappropriate footwear has been implicated in its pathogenesis. Footwear characteristics such as inadequate arch support, poor cushioning, inappropriate heel height, and hard soles may increase plantar fascia stress; however, evidence from eastern India remains limited.

Objectives: To evaluate the association between footwear characteristics and plantar fasciitis among adults attending the Orthopaedic outpatient department of a tertiary care hospital.

Materials and Methods: A hospital-based cross-sectional observational study was conducted in the Department of Orthopaedics, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, between January and February 2026. Fifty adults clinically diagnosed with plantar fasciitis were enrolled using convenience sampling. Information regarding demographic profile, occupation, BMI, footwear characteristics, duration of standing, heel height, sole hardness, arch support, duration of footwear use, and pain severity (Visual Analog Scale) was collected using a structured questionnaire and clinical examination. Data were analyzed using SPSS version 26.0. Descriptive statistics were expressed as frequency, percentage, mean $\pm$ standard deviation. Chi-square test was used to determine the association between footwear characteristics and plantar fasciitis. A p-value <0.05 was considered statistically significant.

Results: Among 50 participants, females constituted 54% and males 46%. The majority belonged to the 20–30-year age group (40%), while 58% were overweight (BMI >25 kg/m²). Sandals (42%) and slippers (30%) were the most frequently used footwear. Hard-soled footwear (56%) and absence of arch support (96%) predominated. Severe heel pain (VAS) was reported by 48% of participants. Chi-square analysis demonstrated a statistically significant association between footwear type and plantar fasciitis ($\chi^2=9.62$; $p<0.05$).

Conclusion: Unsupportive footwear, particularly sandals and slippers lacking adequate arch support and cushioning, appears to be significantly associated with plantar fasciitis. Public awareness regarding appropriate footwear selection, especially among individuals with prolonged standing occupations, may contribute to prevention and improved clinical outcomes.

Keywords: Plantar fasciitis, Footwear characteristics, Heel pain, Arch support, Sole hardness, Cross-sectional study, Odisha
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INTRODUCTION

About 10–15% of foot-related consultations in orthopaedic practice are linked to plantar fasciitis, which is the most common cause of chronic plantar heel pain in adults. Instead of acute inflammation, it is typified by degeneration of the plantar fascia at its calcaneal origin after repeated microtrauma. Due to occupational exposure, prolonged standing, obesity, and altered foot biomechanics, the illness is increasingly being identified in younger people, although it typically affects adults between the ages of 40 and 60. The plantar fascia is crucial for spreading plantar pressure, absorbing shock when walking, and preserving the longitudinal arch of the foot. Collagen deterioration, microtears, fibroblast growth, and chronic discomfort are the outcomes of repetitive mechanical loading that exceeds the physiological limit (1).

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Sharp heel pain usually appears within the first few steps after waking up or after extended periods of inactivity. Walking helps alleviate symptoms initially, but prolonged standing or physical activity causes them to return. Plantar fasciitis has been linked to a number of intrinsic variables, such as obesity, pes planus, pes cavus, Achilles tendon stiffness, and ageing. Footwear has become one of the most significant modifiable extrinsic elements. Normal foot biomechanics are altered by inappropriate footwear that lacks medial arch support, sufficient heel cushioning, or shock-absorbing soles, which increases tensile stress on the plantar fascia.

Increased plantar heel pain has been repeatedly linked to flat slippers, worn-out sandals, hard-soled shoes, and ill-fitting shoes (2).

Repetitive tension on the plantar fascia is further increased by jobs involving extended standing or walking, such as physical labour, farming, healthcare, and factory work. Since many people in underdeveloped nations still wear cheap shoes with little structural support for extended periods of time, footwear-related plantar fasciitis is a significant public health concern. There is little information from eastern India about the connection between footwear features and plantar fasciitis, despite the growing recognition of footwear as a modifiable risk factor. Finding particular risk factors associated with footwear may help with patient education and preventive measures. In order to assess the relationship between footwear characteristics and plantar fasciitis in individuals who visit the orthopaedic outpatient department of Bhima Bhoi Medical College and Hospital in Balangir, Odisha, the current study was conducted (3,4).

Aim

To evaluate the association between footwear characteristics and plantar fasciitis among adults attending the Orthopaedic outpatient department of a tertiary care hospital in Western Odisha.

Objectives Primary Objective

To determine the association between footwear characteristics (type, sole hardness, heel height, arch support, cushioning, and footwear fit) and plantar fasciitis.

Secondary Objectives

- To evaluate the association between duration of footwear use and plantar fasciitis.
- To determine the relationship between footwear type and plantar heel pain.
- To assess the influence of heel height on plantar fasciitis.

- To evaluate the effect of arch support and cushioning on plantar heel pain.
- To determine the association between sole hardness and severity of heel pain.
- To correlate footwear characteristics with pain severity using the Visual Analog Scale (VAS).

MATERIALS AND METHODS STUDY DESIGN

Hospital-based observational cross-sectional study.

Study Setting

Department of Orthopaedics, Bhima Bhoi Medical College and Hospital, Balangir, Odisha.

Study Duration

January 2026 to February 2026.

Study Population

Adult patients attending the Orthopaedic outpatient department with clinically diagnosed plantar fasciitis.

Sample Size

A total of 50 adult patients diagnosed with plantar fasciitis were included in the study.

Inclusion Criteria

- Adults aged ≥ 18 years.
- Clinically diagnosed plantar fasciitis.
- Patients providing written informed consent.

Exclusion Criteria

- Previous foot or ankle surgery.
- Heel fractures or traumatic injuries.
- Rheumatoid arthritis or inflammatory arthropathies.
- Neurological causes of heel pain.
- Calcaneal stress fractures or foot tumors.
- Patients unwilling to participate.

Sampling Technique

Convenience sampling.

Data Collection

A pre-designed structured questionnaire was administered to collect demographic characteristics, occupation, BMI, footwear characteristics, duration of standing, heel height, sole hardness, arch support, footwear usage duration, and pain severity.

Clinical Assessment

Each participant underwent a detailed clinical examination including:

- Local tenderness over the medial calcaneal tubercle
- Foot posture assessment
- Gait analysis
- Achilles tendon tightness
- Visual Analog Scale (VAS) for pain

Radiological investigations (X-ray and ultrasonography) were performed whenever clinically indicated to support diagnosis and exclude other causes of heel pain.

Study Variables Independent Variables

- Type of footwear
- Heel height
- Sole hardness
- Arch support
- Cushioning
- Duration of footwear use
- Standing duration
- Occupation
- BMI

Dependent Variable

- Presence and severity of plantar fasciitis (VAS score)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26.0. Continuous variables were summarized as mean $\pm$ standard deviation, whereas categorical variables were expressed as frequencies and percentages. Associations between categorical variables were analyzed using the Chi-square test or Fisher's exact test where appropriate. Odds ratios (OR) with 95% confidence intervals (CI) were calculated whenever applicable. A p-value <0.05 was considered statistically significant.

Condition of footwear (worn-out or intact)

patient 1.



RESULTS

patient 2.



patient 3.



Shows plantar fascia thickening and increased signal intensity

DISCUSSION

In this hospital-based cross-sectional observational study, 50 adult patients who visited the Orthopaedic Outpatient Department of Bhima Bhoi Medical College and Hospital in Balangir had their footwear features and plantar fasciitis assessed. The study showed that patients with plantar fasciitis usually had improper footwear features, such as the usage of sandals or slippers, hard soles, lack of arch support, and extended standing. Additionally, a statistically significant correlation between the kind of footwear and plantar fasciitis was found by Chi-square analysis ($\chi^2 = 9.62$, $p < 0.05$), suggesting that footwear is a key factor in the development of plantar heel discomfort. Nearly three-fourths of the study's participants were in the 20–40 age range. Although plantar fasciitis has historically been thought of as a condition that mostly affects middle-aged adults, new research indicates that it is becoming more common in younger persons as a result of changes in lifestyle, longer standing, greater physical activity, and vocational demands (5).

This result suggests that plantar fasciitis is rapidly impacting the economically productive age group and is no longer limited to elderly people. In the current survey, women made up a slightly larger percentage (54%) than men (46%). Similar findings that women were more likely to experience plantar heel discomfort have been documented in earlier epidemiological research. Inappropriate footwear

Table 1: Demographic Profile of Study Subjects

Sl	Characteristic	Subclass	Total Number N=50
1	Age	19 years	4
		20-30 Years	20
		31-40 Years	17
		41 – 50 Years	6
		51 - 60 Years	2
		61 -70 Years	1
		71 - 80 Years	0
2	Gender	Male	23
		female	27
3	BMI	<18.5	4
		18.5 - 24.99	17
		>25	29
4	Occupation	Farmer	7
		Office worker	4
		Labourer	11
		Student	4
		Doctor	9
		Athlete	3
		Others	12

Table 2: Distribution according to type of footwear

Footwear type	Total number
Slippers	15
Sandals	21
Sports shoes	6
Formal shoes	8

Table 3: Distribution according to sole type

Sole type	Total number
Soft sole	22
Hard sole	28

choices, such as slippers or flat sandals, extensive domestic duties requiring standing, and hormonal factors altering ligament laxity could all contribute to the higher occurrence among females. Despite the slight gender disparities, these findings corroborate the research that suggests women

Table 4: Distribution according to arch support

Arch support	Total number
yes	2
no	48

Table 5: Distribution according to heel height

Heel height	Total number
Flat	17
<2cm	15
>2cm	18

Table 6: Distribution according to standing duration

Standing duration	Total number
<2 hours	12
2 -4 hours	15
>6 hours	23

Table 7: Distribution according to VAS score

VAS score	Total number
Mild	8
Moderate	18
Severe	24

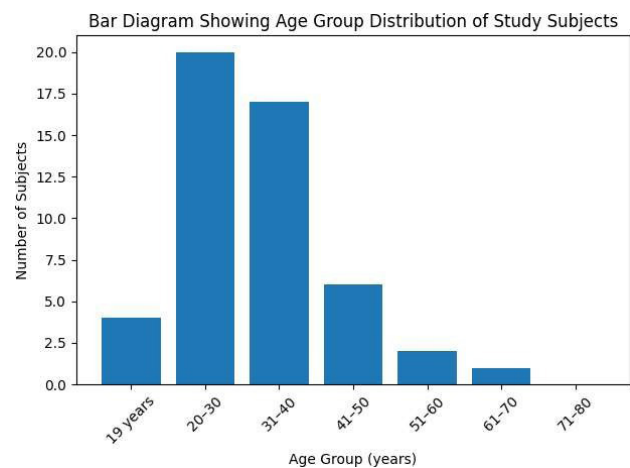


Fig 1: Bar diagram showing Age Group of Study Subjects

are more likely than men to get plantar fasciitis. Another significant conclusion was that 58% of patients had a BMI of more than 25 kg/m². When standing and walking, carrying too much weight increases the mechanical pressure on the plantar fascia, which causes degeneration at the calcaneal connection and repeated micro trauma (6).

Pie Chart Showing Gender Distribution of Study Subjects

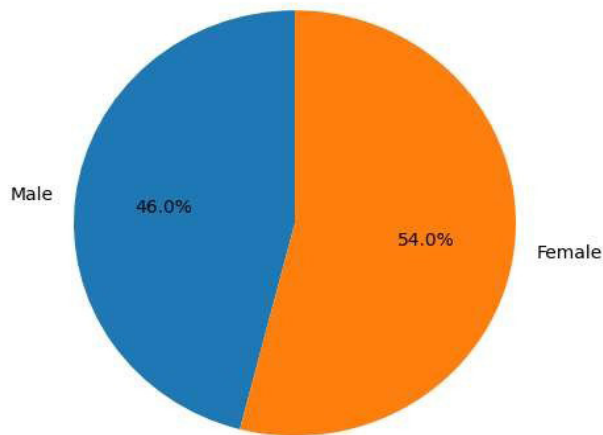


Fig 2: Pie Chart showing Gender Distribution of Study Subjects

Pie Chart Showing BMI Distribution of Study Subjects

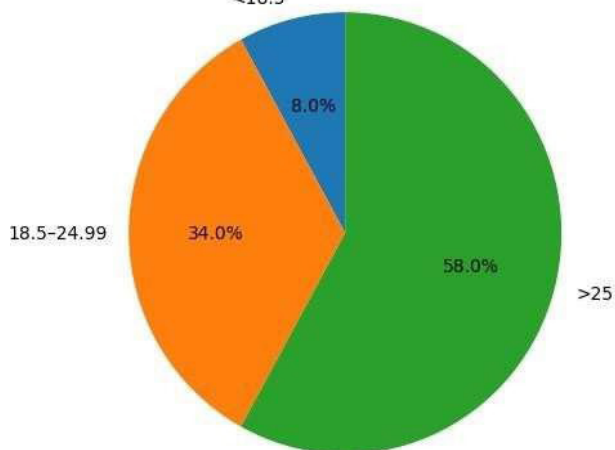


Fig 3: Pie chart showing BMI distribution of study subject

Obesity has consistently been found to be one of the strongest independent risk factors for plantar fasciitis in prior systematic evaluations. As a result, preventive and therapeutic approaches should include weight management. Occupation seemed to affect the incidence of disease as well. A significant percentage of participants were labourers, farmers, and those who had been standing for a long time. Over 45% of participants said they stood for more than six hours every day. Tensile stress on the plantar fascia is increased by continuous weight-bearing activities, especially when accompanied with insufficient footwear. Similar correlations between healthcare professionals, manufacturing workers, educators, and retail employees have been reported, highlighting workplace exposure as a major extrinsic risk factor. The main emphasis of this

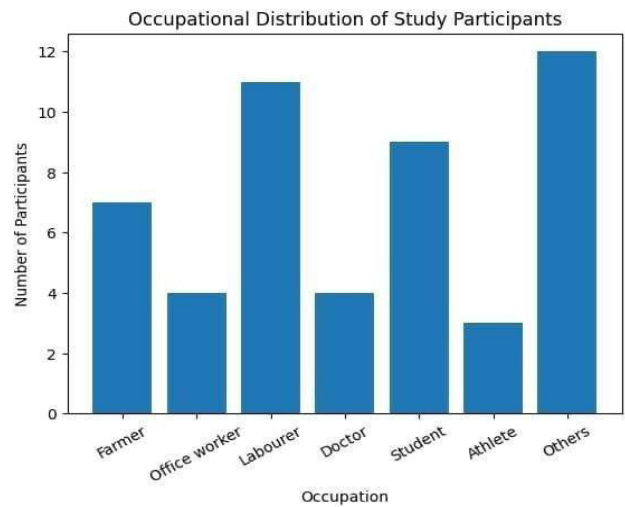


Fig 4: Bar diagram showing occupation distribution among study subjects

Chi-Square Analysis

Footwear Type	PF	Non-PF	Total
Slippers	8	7	15
Sandals	18	3	21
Sports Shoes	2	4	6
Formal Shoes	3	5	8
Total	31	19	50

Conclusion: Since Chi-square (χ^2) = 9.62 is greater than the critical value 7.815, the result is statistically significant ($p < 0.05$). There is a significant association between footwear type and plantar fasciitis.

investigation was the properties of footwear. The most popular shoes among those impacted were sandals (42%) and slippers (30%), whereas only a tiny percentage of them routinely wore athletic shoes with superior structural support (7).

Furthermore, only 4% of individuals reported wearing shoes with sufficient arch support, while 56% of participants wore shoes with hard soles. Insufficient medial arch support increases the tensile tension of the plantar fascia during stride and decreases shock absorption. According to earlier biomechanical research, shoes with the right amount of arch support and cushioning greatly reduce plantar pressure and alleviate heel pain. Therefore, supportive footwear guidelines for plantar fasciitis care and prevention are reinforced by the current data. Nearly half

of the participants experienced severe pain, according to a Visual Analogue Scale measure of pain severity, which may indicate a delay in seeking medical attention and ongoing exposure to triggering variables. Reduced quality of life and chronic plantar fascia deterioration may result from wearing improper footwear despite symptoms (8).

Early identification of risk factors associated with footwear and prompt change of footwear could significantly slow the progression of disease and functional impairment. There are some limitations to the current investigation. The single-center design and somewhat small sample size restrict how broadly the results may be applied. Imaging was only done when necessary, and the clinical diagnosis was mostly dependent on the patient's history and examination. Furthermore, the cross-sectional design makes it impossible to establish causal correlations. However, the study underscores the significance of occupational counselling, preventative education, and footwear modification in lowering the burden of plantar fasciitis and offers important information from Western Odisha addressing modifiable footwear-related risk factors (9,10).

CONCLUSION

Among people visiting a tertiary care orthopaedic outpatient department, the current study showed a strong correlation between footwear features and plantar fasciitis. Affected people frequently wore unsupportive shoes, especially sandals and slippers with firm soles, inadequate arch support, and inadequate padding. The majority of instances included individuals who were overweight or worked in jobs that required them to stand for extended periods of time, indicating that both internal and external variables may play a role in the development of the condition. The significance of choosing the right footwear as a modifiable preventive intervention is highlighted by the statistically significant correlation between the type of footwear and plantar fasciitis. Routine clinical practice should include patient education about supportive footwear, sufficient

heel cushioning, appropriate arch support, and routine replacement of worn-out footwear. Early identification of high-risk individuals, combined with weight reduction, stretching exercises, occupational modifications, and footwear counselling, may substantially reduce symptom severity, improve functional outcomes, and decrease the overall burden of plantar fasciitis in the community.

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