IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

EXPLORING THE RELATIONSHIP BETWEEN THE PLANTAR FASCIITIS AND ITS RISK FACTORS – A CROSS SECTIONAL STUDY

[1]Karthika Devi S, [2]Prof Saravanan K

[1]Bachelor of physiotherapy, Sri Ramakrishna Institute of Paramedical and Sciences, Coimbatore, Tamil Nadu, India

[2]Professor, Department of physiotherapy, Sri Ramakrishna Institute of Paramedical and Sciences, Coimbatore, Tamil Nadu, India

ABSTRACT:

Background: Plantar fasciitis is a common musculoskeletal disorder characterized by heel pain and functional limitations. Several biomechanical and lifestyle-related factors have been implicated in its development and progression. Understanding the relationship between these factors and plantar fasciitis severity may assist in identifying individuals at risk and planning appropriate interventions.

Aim: To explore the relationship between plantar fasciitis and its associated risk factors, including body mass index (BMI), standing duration, ankle dorsiflexion range, pain intensity, and foot arch type.

Methods: A cross-sectional observational study was conducted among 100 participants diagnosed with plantar fasciitis. Data were collected using the Plantar Fasciitis Pain and Disability Scale (PFPS), Visual Analogue Scale (VAS), body mass index measurements, goniometric assessment of ankle dorsiflexion, and foot arch evaluation. Correlation analyses were performed to determine the association between PFPS scores and the selected risk factors.

Results: Significant associations were identified between plantar fasciitis severity and all measured variables. Positive correlations were observed between PFPS scores and BMI ($r = 0.69$), standing duration ($r = 0.59$), pain intensity ($r = 0.77$), and foot arch type ($\rho = 0.68$). A significant negative correlation was found between ankle dorsiflexion range and PFPS scores ($r = -0.61$). All findings were statistically significant ($p < 0.001$).

Conclusion: Plantar fasciitis severity is significantly associated with increased BMI, prolonged standing, higher pain intensity, reduced ankle dorsiflexion, and abnormal foot arch posture. Addressing these modifiable factors may help reduce symptom severity and improve functional outcomes in individuals with plantar fasciitis.

Keywords: Plantar Fasciitis, Body Mass Index, Dorsiflexion Range, Foot Arch Type, Standing Duration, Pain Intensity, PFPS.

INTRODUCTION

Plantar fasciitis (PF) is among the most frequently reported causes of heel pain and is a common musculoskeletal condition affecting adults worldwide. The plantar fascia is a thick band of connective tissue extending from the calcaneus to the proximal phalanges, where it plays an important role in maintaining the medial longitudinal arch of the foot and facilitating efficient gait mechanics. Repetitive loading and excessive tensile stress on this structure may result in microdamage, degeneration, and persistent heel pain. (3)

The lifetime prevalence of plantar fasciitis is estimated to be approximately 10%, making it a significant clinical problem encountered in orthopaedic and physiotherapy practice. The condition is most commonly observed in middle-aged adults, although it can affect individuals of various age groups depending on occupational and recreational activities. (2)

Patients with plantar fasciitis typically report pain at the plantar aspect of the heel, particularly during the first few steps after waking or following prolonged periods of rest. As symptoms progress, pain may interfere with walking, standing, occupational duties, and recreational activities, thereby reducing functional independence and quality of life. (3)

The development of plantar fasciitis is considered multifactorial, involving a combination of intrinsic and extrinsic risk factors. Increased body mass index (BMI) has been identified as an important contributor because excessive body weight increases mechanical loading on the plantar fascia during weight-bearing activities. Several studies have demonstrated a significant association between obesity and plantar fasciitis, suggesting that increased plantar stress may accelerate tissue degeneration. (7)

Occupational and lifestyle factors also play a crucial role in the onset and progression of plantar fasciitis. Individuals whose occupations require prolonged standing or walking, such as healthcare workers, retail employees, and industrial workers, are exposed to repetitive loading of the plantar structures. Previous investigations have reported a higher prevalence of plantar fasciitis among individuals who spend extended periods on their feet, particularly on hard surfaces. (1)

Restricted ankle dorsiflexion has been recognized as another important biomechanical factor associated with plantar fasciitis. Limited dorsiflexion may alter lower-limb movement patterns, increase compensatory foot pronation, and place excessive strain on the plantar fascia during gait. Research findings suggest that reduced ankle mobility is significantly associated with increased plantar fascia stress and symptom severity. (6)

Foot morphology also influences the distribution of forces across the plantar surface of the foot. Individuals with flat feet or excessively pronated foot postures often demonstrate altered biomechanics, leading to increased tension within the plantar fascia. Previous studies have reported a greater occurrence of plantar fasciitis among individuals with pes planus and other abnormal arch patterns. (11)

Despite the growing body of literature regarding plantar fasciitis, the relative contribution of different risk factors may vary across populations and occupational groups. Identifying the factors most strongly associated with plantar fasciitis severity is important for developing effective preventive strategies and evidence-based rehabilitation programs. Therefore, the present study was undertaken to explore the relationship between plantar fasciitis and selected risk factors, including body mass index, duration of standing, ankle dorsiflexion range, pain intensity, and foot arch type among individuals diagnosed with plantar fasciitis.

Material and Methodology

Materials used for the study:

- Consent form,
- Data collection form,
- Pen,
- Paper,
- Visual analogue scale [VAS],
- Plantar fasciitis pain and disability scale [PFPS] questionnaire.
- Goniometer,
- Weight machine,
- Stadiometer or inch tape

Study design:

A Cross sectional observational study.

Study duration:

The study duration was about 6 months**.**

Study setting:

The study were carried out in the outpatient physiotherapy department, Sri Ramakrishna Multi speciality Hospital.

Sampling method:

Purposive Sampling.

Sampling size:

A total sample of 100 participants were selected based on inclusion and exclusion criteria.

Criteria for selection:

Inclusion criteria:

- Age group of 30 to 50 years.
- Both gender.
- Inadequate foot wear at work.
- Duty hours more than 5 hours.
- Patient have Plantar fasciitis pain and disability scale [PFPS] score more than 35.
- Patient with windlass test positive.

Exclusion criteria:

- History of trauma and surgery to the lower extremity.
- Limb length discrepancy.
- Any musculoskeletal deformity of foot and Neurological deficit
- Other foot or heel pathologies.
- Systemic condition like rheumatoid arthritis, diabetes

Variables:

Dependent variable:

Plantar Fasciitis

Independent variables:

Body mass index,

Foot arch type [flat feet, high arches],

Duration of Standing or walking per day ,

Ankle dorsiflexion range,

Pain.

Assessment tools:

Body Mass Index [BMI],

Goniometer,

Visual analogue scale [VAS] for pain,

Plantar fasciitis pain/disability scale.

Procedure:

This study was based on purposive sampling method with subjects of 100 participants who fulfilled the inclusion and exclusion criteria were recruited. Prior to the study subjects were explained in detail about the study and procedure to be applied.

After obtaining ethical clearance and informed consent, data collection was carried out in the physiotherapy outpatient department. Each patient's demographic details, occupation, duty hours and symptom duration were recorded.

The participant's severity of plantar fasciitis was assessed by using the questionnaire known as Plantar Fasciitis Pain/Disability Scale [PFPS].

BMI [Body Mass Index] measurement - Height was measured by using inch tape and weight is measured by weight machine. Then BMI calculation formula is used. [Weight(kg)/Height (m^2)]

Dorsiflexion range was measured by goniometer. Foot arch type was assessed visually. Pain was measured by Visual Analog Scale [VAS] which range from 0-10.

Data was analyzed using pearson correlation / spearman rank correlation to determine the association between plantar fasciitis severity and the risk factors [BMI, dorsiflexion, duty hours or duration of standing, foot arch type, pain]

RESULTS

A correlation analysis was conducted to examine the relationship between plantar fasciitis severity and its associated risk factors, including BMI, standing duration, pain intensity, dorsiflexion range, and foot arch type.

There was a strong positive correlation between BMI and PFPS score, $r(98) = 0.69$, $p < .001$, indicating that individuals with higher BMI reported greater plantar fasciitis severity.

Standing duration also showed a moderate positive correlation with PFPS severity, $r(98) = 0.59$, $p < .001$, suggesting that participants who spent longer hours standing experienced higher symptoms.

Pain intensity demonstrated the strongest positive correlation with severity, $r(98) = 0.77$, $p < .001$, showing that increased pain levels were associated with higher disability.

A strong negative correlation was found between dorsiflexion range and PFPS score, $r(98) = –0.61$, $p < .001$, meaning that reduced ankle dorsiflexion was strongly linked with increased plantar fasciitis severity.

Since foot arch type is an ordinal variable, Spearman's rho was used. Results revealed a strong positive association between foot arch type and PFPS severity, $\rho(98) = 0.68$, $p < .001$. Participants with flatter arches tended to show higher severity scores compared to those with normal arches.

Discussion

The purpose of this study was to examine the relationship between plantar fasciitis severity and selected biomechanical and occupational risk factors, including body mass index (BMI), foot arch type, ankle dorsiflexion range, standing duration, and pain intensity. The findings demonstrated significant correlations between all measured variables and PFPS scores, supporting the multifactorial etiology of plantar fasciitis.

A strong positive correlation was found between **BMI and PFPS severity** ($r = 0.69$), indicating that individuals with higher BMI experienced more severe symptoms. This outcome is consistent with previous research showing that increased body mass contributes to elevated plantar fascia loading during gait and weight-bearing activities, resulting in microtrauma and chronic strain (**van Leeuwen et al., 2022; Ozdemir et al., 2005**). Obesity has repeatedly been identified as a primary risk factor in both athletic and non-athletic populations, likely due to increased mechanical stress on the heel and longitudinal arch.

Similarly, **standing duration demonstrated a moderate positive correlation** with PFPS severity ($r = 0.59$). Participants who spent a greater number of hours on their feet reported higher pain and disability levels. This relationship aligns with previous studies in occupational health, which found that prolonged weight-bearing—particularly on hard surfaces—significantly increases the risk of plantar fasciitis among workers such as nurses, retail employees, and industrial laborers **(Sikander et al., 2024; Werner et al., 2010).** These findings further reinforce the role of occupational loading and repetitive mechanical stress in plantar fascia irritation.

Pain intensity showed the strongest positive correlation with PFPS scores ($r = 0.77$). This result is expected because PFPS directly evaluates pain-related functional difficulty. High VAS scores typically correspond to greater limitations in daily activities such as walking, prolonged standing, and morning ambulation. The strong association observed in the present study is consistent with previous findings demonstrating the validity of the PFPS scale in measuring symptom severity among plantar fasciitis patients **(Willis et al., 2009).**

A **strong negative correlation** was also observed between **ankle dorsiflexion range and PFPS severity** ($r = –0.61$). Individuals with reduced dorsiflexion displayed greater disability, suggesting that limited ankle mobility contributes to abnormal loading patterns. Prior research demonstrates that restricted dorsiflexion increases tension within the Achilles tendon–plantar fascia complex, promoting compensatory overpronation and higher strain during gait **(Park et al., 2018; Lee et al., 2021**). Thus, reduced dorsiflexion is widely recognized as a significant biomechanical contributor to plantar fasciitis.

Furthermore, **foot arch type showed a moderate-to-strong positive correlation** with PFPS scores ($\rho = 0.68$). Participants with flat feet exhibited more severe symptoms than those with normal arches. Flat foot posture increases pronation, lengthens the plantar fascia, and alters pressure distribution across the medial arch. Prior studies have reported thicker plantar fascia, reduced dorsiflexion, and impaired foot mechanics in individuals with pes planus, which heightens the risk of plantar fascia strain (**Huang et al., 2004; Park et al., 2018).**

Overall, the findings of this study align with existing literature indicating that plantar fasciitis arises from a combination of intrinsic and extrinsic risk factors **(Barry, 2016; Hamstra-Wright et al., 2021**). The present results support the importance of comprehensive assessment in clinical practice, emphasizing the role of modifiable factors such as body weight, calf flexibility, foot posture, and occupational load management. Early identification of individuals at higher risk—

particularly those with elevated BMI, restricted dorsiflexion, prolonged standing hours, or flat feet—may help prevent symptom progression and improve long-term functional outcomes.

The statistical findings demonstrated significant correlations ($p < 0.001$) between PFPS severity and all measured risk factors. Therefore, the null hypothesis—stating that there was no significant relationship between plantar fasciitis and its risk factors—is rejected, and **the alternative hypothesis was accepted**. The results confirm that BMI, foot arch type, dorsiflexion range, standing duration, and pain intensity are all significantly associated with plantar fasciitis severity in the study population.

Conclusion

The study concludes that plantar fasciitis severity was significantly associated with multiple risk factors. Higher BMI, increased standing duration, greater pain intensity, and flat foot posture contribute to higher severity levels. Reduced dorsiflexion range further exacerbates symptoms. Among all factors, pain intensity and BMI showed the strongest associations with PFPS scores.

These findings emphasize the importance of a comprehensive assessment approach in physiotherapy practice. Addressing modifiable risk factors such as weight reduction, improving dorsiflexion mobility, and correcting foot posture may play an essential role in reducing symptom severity and improving functional outcomes. Early intervention strategies targeting these risk factors can help prevent chronic disability and enhance quality of life in individuals with plantar fasciitis.

References

1. **Komal Santosh Bhoir, Vishnu Vardhan.** Prevalence of plantar fasciitis among nurses at a tertiary care centre in a rural area: A cross sectional study. *International journal of physiotherapy and research.* 11 August 2021, Vol. 9, 4, pp. 3900-06.

2. **Zenat Khired, Muhannad H. Najmi , Ahmed A. Akkur , Mashhour A. Mashhour , Khalid A. Bakri.** The Prevalence and Risk Factors of Plantar Fasciitis Amongst the Population of Jazan. 21 Sep 2022, Vol. 14, 9.

3. **Buchanan, Benjamin K., Sina, Reddog E. and Kushner., Donald.** Plantar Fasciitis. *National Library of Medicine.* [Online] 7 Jan 2024. https://www.ncbi.nlm.nih.gov/books/NBK431073/.

4. **Robert A. Werner, MD MS, Nancy Gell, MPH PT, Anne Hartigan, MD,.** Risk Factors for Plantar Fasciitis Among Assembly. Feb 2010, Vol. 2, 2, pp. 110-116.

5. **Dr. Muhammad Suleman Sikander1*, Naeem Ullah Shinwari2*, Dr. Jamal Shah3*, Dr. Muhammad Atif4.** Prevalence and Association of Risk Factors for Plantar Fasciitis. 2024, Vol. 4, 2, pp. 1623-1628.

6. **Karrie L. Hamstra-Wright, PhD, Kellie C. Huxel Bliven,R. Curtis Bay, PhD,and Burcu Aydemir.** Risk Factors for Plantar Fasciitis in Physically Active Individuals: A Systematic Review and Meta-analysis. 2021, Vol. 13, pp. 296-303.

7. **K D B van Leeuwen1, J Rogers2, T Winzenberg3, M van Middelkoop1.** Higher body mass index is associated with plantar fasciopathy/'plantar fasciitis': systematic review and meta-analysis of various clinical and imaging risk factors. *https://bjsm.bmj.com/content/50/16/972.* [Online]

8. **Buck Willis, PhD1 , Angel Lopez, Andres Perez, Larry Sheridan,Stanley R Kalish.** Pain Scale for Plantar Fasciitis. 2009, Vol. 2, 5.

9. **Reda A. Goweda, Enas H. Alfalogy, Roaa N. Filfilan,Ghufran A. Hariri.** Prevalence and Risk factors of Plantar Fasciitis among Patients with Heel Pain Attending Primary Health Care Centers of Makkah, Kingdom of Saudi Arabia. 2015, Vol. 45, 2, pp. 71-75.

10. **Barry, Dr. Melissa.** Causation and risk factors of Plantar Fasciitis. April 2016.

11. **Se-Yeon Park, Hyun-Seok Bang,Du-Jin Park.** Potential for foot dysfunction and plantar fasciitis according to the shape of the foot arch in young adults. 16 April 2018 , Vol. 14, 3, pp. 497-502.

12. **Yu-Chi Huang, MD, et al.** The Relationship between the Flexible Flatfoot and Plantar Fasciitis: Ultrasonographic Evaluation. Feb20 2004, Vol. 27, 6, pp. 443-448.

13. **Sena Özdemir Görgu, Naile Hande Yazıcı,Betül Nur Kocagöz, And Esra Atılgan.** Validity and Reliability of the Turkish Version of the Plantar Fasciitis Pain/ Disability Scale. 25 Jan 2025, Vol. 8, 1, pp. 34-40.

14. **Kuo-Chang SUNG, Jui-Yuan CHUNG, I-Jung FENG,Shu-Han YANG,Chien-Chin HSU1, 5, Hung-Jung LIN1, Jhi-Joung WANG, and Chien-Cheng HUANG.** Plantar fasciitis in physicians and nurses: a nationwide population-based study. 20 Sep 2019, Vol. 58, pp. 153-160.

15. **Orchard, John.** Plantar fasciitis. 13 Oct 2012, Vol. 345.

16. **Javier Pascual Huerta, Clínica del Pie Elcano, Bilbao.** Relationship of Body Mass Index, Ankle Dorsiflexion, and Foot Pronation on Plantar Fascia Thickness in Healthy, Asymptomatic Subjects. Sep 2008, Vol. 98, 5, pp. 379-385.

17. **Ujala Malik, Ayman Fatima, Esha Ahmad, Syeda Zainab Taqi, Iqra Tahir, Anam Rehman.** Prevalence of Plantar Fasciitis Pain and Its Association with Quality of Work Among Sales Promotion Persons at Supermarkets. 29 Sep 2024, Vol. 4, 3.

18. **Riddle, Daniel L. PT, PhD, et al.** Risk Factors for Plantar Fasciitis: A Matched Case-Control Study. May 2003, Vol. 85, 5, pp. 872-877.

19. **E. R. Waclawski, J. Beach, A. Milne, E. Yacyshyn, D. M. Dryden.** Systematic review: plantar fasciitis and prolonged weight bearing Get access Arrow. 17 Feb 2015, Vol. 65, 2, pp. 97-106.

20. **Omidi-Kashani, Hadi Ghotbi Joshvaghan and Farzad.** Plantar Fasciitis Risk Factorsin Normal Population. 2018, Vol. 15, 2.

21. **Huseyin Ozdemira, Erhan Yilmazb,Ayse Murata,, Lokman Karakurtb,A. Kursad Poyraza,Erkin Ogur.** Sonographic evaluation of plantar fasciitis and relation tobody mass index. 10 Sep 2005, Vol. 54, pp. 443-447.

22. **Wonyong Lee, MD1 , Neha Metgud, BS2, and Michelle Moore, MD1.** Association of Obesity and Plantar Fasciitis in Patients With Plantar Heel Spurs. 2023, Vol. 8, 4, pp. 1-7.

23. **Senanayake1* & L Jayalath, K.** Effects of obesity on foot outcomes and quality of life in women with plantar fasciitis. 2025, Vol. 1, 1.

24. **Ni Ketut Maya Purvitagiri, , Linda Dewanti,, Sulis Bayusentono,, Indrayuni Lukitra ,Wardhani.** CORRELATION BETWEEN PROLONGED STANDING AND PLANTAR FASCIITIS. 2017, Vol. 6, 1, pp. 33-39.

25. **Insharah Bint e Ejaz, Muhammad Hussain Iqbal, Fariha Khalid,, Warda Rauf,, Hafsa Zahid.** The Prevalence of Plantar Fasciitis and its Association withPosture in Salesmen with Prolonged Standing. 4 July 2025, Vol. 3, 8.

26. **Soon Hyuck Lee MDPhD, Dong Hun Suh MDPhD,, Hak Jun Kim MDPhD, Woo Young Jang MDPhD, Young Hwan Park MDPhD,Hyun Jae Sung MD ,, Gi Won Choi MDPhD.** Association of Ankle Dorsiflexion With Plantar Fasciitis. 2021, Vol. 60, 4, pp. 733-737.

27. **Lori A Bolgla, Terry R Malone .** Plantar Fasciitis and the Windlass Mechanism: A Biomechanical Link to Clinical Practice. 2004, Vol. 39, 1, pp. 77-82.

28. **y Seongok Chae, Hyun Soo Kang ,Hojik Lee ,Yoo-Jin Jun,SeungMyung Choi,Young-Phil Yune, andHyung-Soon Park ,.** How Does Foot Arch Type Affect Gait Biomechanics in Patients with Plantar Fasciitis? 5 Nov 2025, Vol. 5, 4.