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ORIGINAL ARTICLE

Prevalence of Plantar Fasciitis Among Operation Theatre Personnel: A Cross-Sectional Study

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Abstract

Background: Plantar fasciitis is one of the most common musculoskeletal disorders affecting the foot, characterised by degenerative inflammation of the plantar fascia at its calcaneal insertion. Operation theatre (OT) personnel are an occupationally high-risk group due to prolonged standing on hard surfaces, heavy footwear usage, and inadequate rest breaks. However, published data on the prevalence of plantar fasciitis specifically among OT staff remain limited. **Methods:** A cross-sectional study was conducted among 97 operation theatre personnel at Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur. Plantar fasciitis was assessed clinically and functionally using the Roles and Maudsley Score and the American Orthopaedic Foot and Ankle Society (AOFAS) Score. Data on BMI, duration of standing, floor type, footwear type, physical activity, and ergonomic factors were collected. Statistical analysis included Chi-square test for categorical associations and multivariate logistic regression for independent predictors. **Results:** The overall prevalence of plantar fasciitis was 73.2% (71/97). BMI ($p = 0.007$), standing duration >6 hours/day ($p = 0.002$), hard floor exposure ($p = 0.030$), and irregular physical activity ($p = 0.024$) were significantly associated with plantar fasciitis. On multivariate analysis, prolonged standing >6 hours (Adjusted OR: 5.10; 95% CI: 1.23–21.14; $p = 0.025$), absence of breaks during surgery (Adjusted OR: 5.59; 95% CI: 1.31–23.88; $p = 0.020$), and non-use of cushioned footwear (Adjusted OR: 4.35; 95% CI: 1.02–18.52; $p = 0.047$) were independent predictors. **Conclusion:** Plantar fasciitis is highly prevalent among OT personnel. Prolonged standing, elevated BMI, absence of rest breaks, and inadequate footwear are major modifiable risk factors. Workplace ergonomic interventions including scheduled breaks, cushioned footwear, and anti-fatigue matting are urgently needed.

Keywords: Plantar fasciitis, Operation theatre personnel, Occupational health, AOFAS score, Roles and Maudsley Score, Ergonomics, Risk factors

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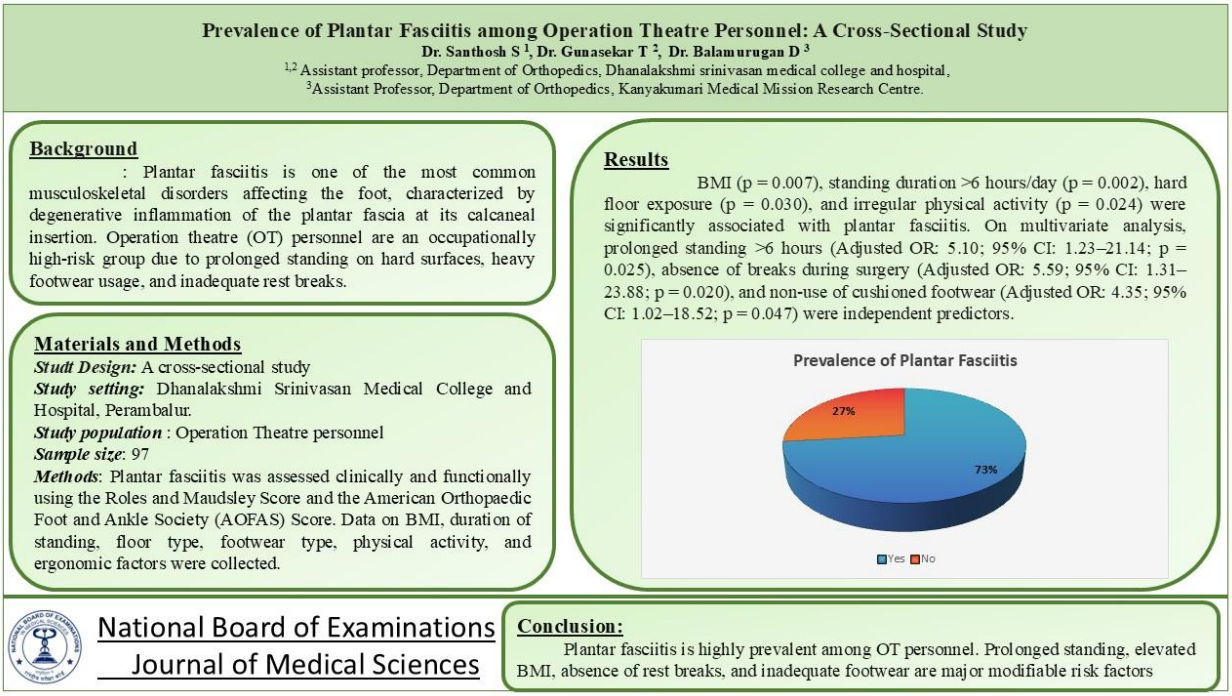
Graphical Abstract



Introduction

Plantar fasciitis is the most common cause of heel pain in adults and accounts for nearly 80% of cases seen by foot and ankle specialists [1]. It develops due to repeated small injuries at the point where the plantar fascia attaches to the medial calcaneal tuberosity of the heel bone. This leads to a long-term degenerative change marked by disturbed collagen fibres, fibrocyte proliferation, and myxoid degeneration, rather than a true inflammatory process [2]. The annual incidence is around 2 million cases in the United States, and the lifetime prevalence is about 10% in the general population [3].

Operation theatre (OT) personnel, including surgeons, anaesthetists, nurses, and technicians, are considered a high-risk group for this condition. Their work often requires standing continuously for long hours, sometimes more than six hours at a time, on hard floor surfaces [4]. These stresses are increased by the use of formal or poorly cushioned footwear and the difficulty of taking breaks during surgical procedures. Obesity can further increase strain on the plantar fascia because of excess body weight and abnormal loading forces [5].

Although these risk factors are common among OT staff, there are only a few studies measuring the prevalence of plantar fasciitis in this group. Most previous research has focused on the general population, runners, or military personnel, with less attention given to healthcare workers working in operation theatres [6,7]. In addition, functional assessment tools such as the Roles and Maudsley Score and the American Orthopaedic Foot and Ankle Society (AOFAS) Score have rarely been used in occupational studies, so the level of disability among affected OT staff is not well understood [8].

Because of this lack of evidence, the present study was planned to determine the

prevalence of plantar fasciitis among operation theatre personnel, assess functional impairment using validated scoring systems, and identify modifiable occupational and body-related risk factors that independently predict the condition. The results may help in developing evidence-based ergonomic policies in hospital workplaces.

Materials and Methods

Study Design and Setting

A cross-sectional study was conducted in the operation theatres of Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur, Tamil Nadu, India. Ethics approval was obtained from the Institutional Ethics Committee on Human Subjects (Reg. No. IECHS/IRCHS/DSMCH/Cert/1037, dated 27 January 2026) in accordance with the Standard Operating Procedures of the IECHS. Written informed consent was obtained from all participants prior to enrolment.

Study Population

All operation theatre personnel actively working in the OT complex were considered for inclusion. Eligible participants included nurses, technicians, surgeons, and anaesthetists. Personnel who had sustained a lower limb fracture or injury within the preceding six months, those with rheumatological disorders, peripheral vascular disease, or peripheral neuropathy, and those who were pregnant were excluded. Of 112 OT personnel approached, 97 fulfilled the inclusion criteria and consented to participate.

Sample Size

The sample size was calculated using the formula $n = Z^2pq/d^2$, assuming a reference prevalence of plantar fasciitis of 50% ($p = 0.50$), a precision of 10% ($d = 0.10$), and a 95% confidence level ($Z = 1.96$), yielding a minimum of 96 participants. A total of 97 were enrolled.

Clinical Assessment

Plantar fasciitis was diagnosed clinically based on the presence of all three of the following criteria: (a) heel pain that was maximal with the first steps in the morning or after prolonged rest, (b) localised tenderness over the medial calcaneal tuberosity at the origin of the plantar fascia, and (c) pain aggravation on passive dorsiflexion of the toes (Windlass test). Each participant's anthropometric data (height, weight, BMI) were recorded. BMI was classified as normal (<25 kg/m²), overweight (25–29.9 kg/m²), and obese (≥30 kg/m²) per WHO criteria.

Functional Outcome Scoring

Functional impairment was assessed using two validated instruments:

Roles and Maudsley Score (RMS)

A 4-point ordinal scale where 1 = excellent (no pain, full activity), 2 = good (occasional pain, full activity), 3 = fair (pain limiting some activities), and 4 = poor (pain markedly limiting activity). Scores of 3–4 indicate clinically significant functional impairment.

American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale

A 100-point composite score encompassing pain (40 points), function (50 points), and alignment (10 points). Scores below 75 indicate impaired function.

Exposure Variables

Occupational and lifestyle exposure data were collected through a structured interviewer-administered questionnaire. Variables assessed included: duration of daily standing in the OT (categorised as <2, 2–4, 4–6, and >6 hours per day); floor type (hard surface, anti-fatigue mat, or both); type of footwear (cushioned versus non-cushioned); use of shoe inserts or insoles; frequency of breaks during surgery; and level of physical activity outside work (regular versus occasional, defined as exercise on <3 days per week). Foot pain affecting work performance and history of leave taken due to foot pain were also documented.

Statistical Analysis

Data were entered in Microsoft Excel 2019 and analysed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation and compared using the independent samples t-test or Mann-Whitney U test as appropriate after checking for normality using the Shapiro-Wilk test. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test. Variables with $p < 0.20$ on univariate analysis were entered into a forward conditional multivariate logistic regression model to identify independent predictors of plantar fasciitis. Results are presented as adjusted odds ratios (OR) with 95% confidence intervals (CI). A two-tailed p value of <0.05 was considered statistically significant.

Results

Participant Characteristics and Prevalence

A total of 97 operation theatre personnel were enrolled in the study. The overall prevalence of plantar fasciitis was 73.2%, with 71 participants (73.2%) affected and 26 (26.8%) unaffected (Figure 1). Occupation-wise distribution showed plantar fasciitis in 28 of 37 nurses (75.7%), 15 of 21 technicians (71.4%), 14 of 19 surgeons (73.7%), and 14 of 20 anaesthetists (70.0%). The condition was prevalent across all occupational categories, with nurses contributing the largest number of absolute cases (Figure 2).

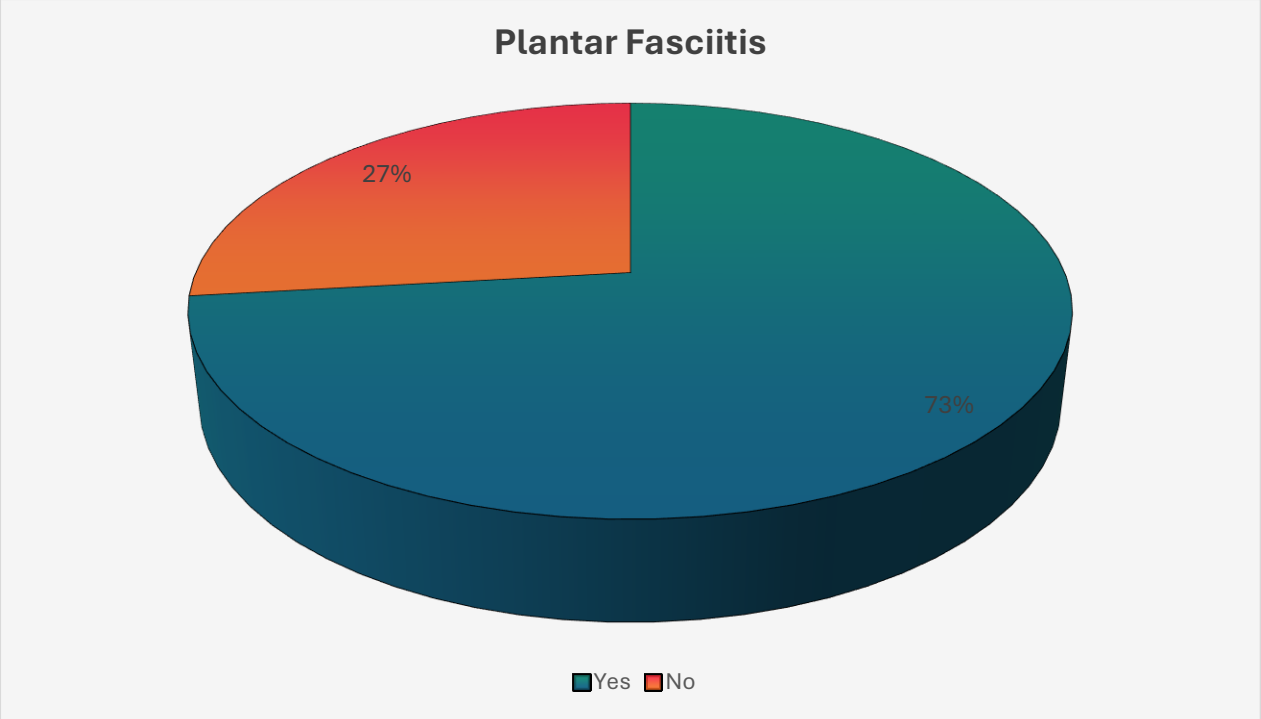


Figure 1. Overall prevalence of plantar fasciitis among operation theatre personnel

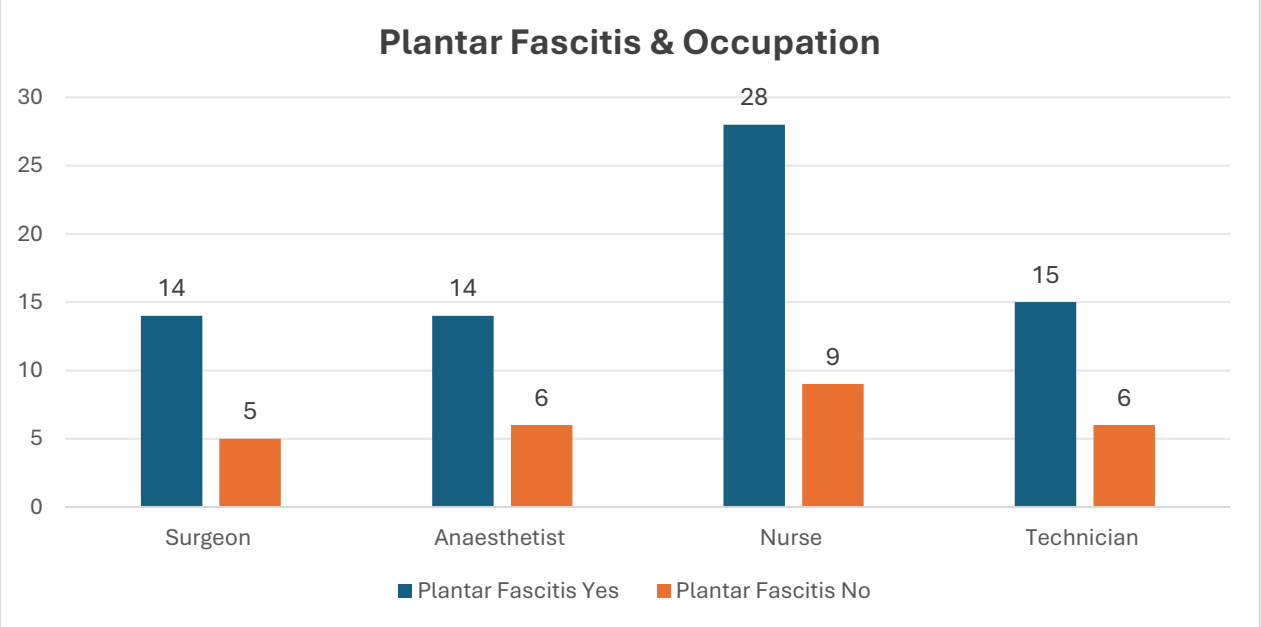


Figure 2. Occupation-wise distribution of plantar fasciitis among operation theatre personnel

Table 1. Comparison of demographic and clinical scores between participants with and without plantar fasciitis

Variable	PF: Yes	PF: No	p-value
Age (years)	31.14±5.34	28.81±5.76	0.06
	31.00 (28.00–36.00)	28.00 (24.00–32.50)	
BMI	27.66±4.07	24.26±3.09	<0.001*
	27.20 (24.40–30.75)	24.15 (22.65–25.48)	
Roles & Maudsley Score (1-4)	3.10±0.72	1.31±0.47	<0.001*
	3.00 (3.00–4.00)	1.00 (1.00–2.00)	
AOFAS Score (0-100)	58.89±7.21	89.85±6.10	<0.001*
	60.00 (53.00–64.00)	90.00 (85.50–94.75)	

** Statistically significant ($p < 0.05$); NS = Not significant; PF = Plantar fasciitis*

Association of Occupational and Anthropometric Factors with Plantar Fasciitis

BMI was significantly associated with plantar fasciitis ($\chi^2 = 9.85$, $p = 0.007$). The prevalence was highest among obese participants (22/24; 91.7%), followed by overweight participants (24/30; 80.0%), and those with normal BMI (25/43; 58.1%). Duration of daily standing in the OT was significantly associated with plantar fasciitis ($\chi^2 = 15.4$, $p = 0.002$), with the highest prevalence among those standing for more than six hours per day (40/46; 87.0%). Floor type was significantly related ($\chi^2 = 6.985$, $p = 0.030$), with participants working predominantly on hard surfaces showing the highest prevalence (48/58; 82.8%). Participants who engaged only in occasional physical activity had a significantly higher prevalence compared to those with regular activity ($\chi^2 = 5.096$, $p = 0.024$). Work-related functional factors — including absence of breaks during surgery ($p = 0.003$), non-use of cushioned footwear ($p = 0.002$), and non-use of shoe inserts or insoles ($p = 0.009$) — were all significantly associated with plantar fasciitis. Foot pain affecting work performance and leave taken due to foot pain were the most strongly associated factors (both $p < 0.001$) Association of BMI, occupational exposure, and lifestyle factors with plantar fasciitis are given in Table 2.

Table 2. Association of occupational and anthropometric factors with plantar fasciitis

Variables		**PF: Yes n (%)**	**PF: No n (%)**	**Chi-square Value**	**p value**
BMI	Normal	25 (58.1%)	18 (41.9%)	9.85	0.007*
	Obese	22 (91.7%)	2 (8.3%)		
	Overweight	24 (80.0%)	6 (20.0%)		
Standing Hours/Day (OT)	2-4 hours	7 (46.7%)	8 (53.3%)	15.4	0.002*
	4-6 hours	24 (70.6%)	10 (29.4%)		
	Less than 2 hours	0 (0.0%)	2 (100.0%)		
	More than 6 hours	40 (87.0%)	6 (13.0%)		
Floor Type	Anti-fatigue mat	7 (53.8%)	6 (46.2%)	6.985	0.03*
	Both	16 (61.5%)	10 (38.5%)		
	Hard surface	48 (82.8%)	10 (17.2%)		
Physical Activity	Occasional	29 (74.4%)	10 (25.6%)	5.096	0.024*
	Regular	10 (45.5%)	12 (54.5%)		
Functional Factors	Breaks During Surgery	25 (58.1%)	18 (41.9%)	8.925	0.003*
	Cushioned Footwear	17 (53.1%)	15 (46.9%)	9.805	0.002*
	Shoe Inserts/Insoles	14 (53.8%)	12 (46.2%)	6.779	0.009*
	Foot Pain Affects Work	58 (93.5%)	4 (6.5%)	36.278	<0.001*
	Leave Taken Due to Foot Pain	35 (94.6%)	2 (5.4%)	13.961	<0.001*

***** *Statistically significant ($p < 0.05$)*

Multivariate Logistic Regression Analysis

Multivariate logistic regression identified three independent predictors of plantar fasciitis (Table 3). Prolonged standing for more than six hours per day carried the highest odds of plantar fasciitis after adjustment (Adjusted OR: 5.10; 95% CI: 1.23–21.14; p = 0.025), followed by the absence of breaks during surgery (Adjusted OR: 5.59; 95% CI: 1.31–23.88; p = 0.020), and the non-use of cushioned footwear (Adjusted OR: 4.35; 95% CI: 1.02–18.52; p = 0.047). Non-use of shoe inserts, hard floor exposure, and use of formal footwear were associated with increased odds but did not attain statistical significance after adjustment.

Table 3. Multivariate logistic regression analysis of predictors of plantar fasciitis

Predictor	**B (SE)**	**Adjusted OR (95% CI)**	**p-value**
Standing > 6 hours/day	1.629 (0.726)	5.10 (1.23–21.14)	0.025*
Absence of breaks during surgery	1.721 (0.741)	5.59 (1.31–23.88)	0.020*
Non-use of cushioned footwear	1.470 (0.739)	4.35 (1.02–18.52)	0.047*
Non-use of shoe inserts	0.705 (0.718)	2.02 (0.50–8.27)	0.326 (NS)
Hard floor exposure	1.267 (0.686)	3.55 (0.93–13.61)	0.065 (NS)
Formal footwear	0.493 (0.910)	1.64 (0.28–9.74)	0.588 (NS)

** Statistically significant (p < 0.05); NS = Not significant; OR = Odds ratio; CI = Confidence interval; SE = Standard error*

Discussion

The present study showed a high prevalence of plantar fasciitis (73.2%) among operation theatre personnel. This is much higher than the prevalence reported in the general adult population (around 10%) and is similar to other occupations involving prolonged standing, such as military recruits and distance runners [3,7]. A cross-sectional study among street vendors in Delhi where they are exposed to prolonged standing, reported heel pain among 46.1% of workers who had higher BMI and longer standing hours as significant risk factors [9]. These findings show that workers in standing-intensive jobs carry a high and often neglected musculoskeletal burden. The comparatively high prevalence noted in this study may attributed to the occupational bunching of multiple risk factors among OT personnel, comprising prolonged standing on hard surfaces, limited rest breaks, and defective footwear support. Furthermore, diagnosis was based on a rigorous combination of clinically typical symptoms

and examination findings, which may have augmented case detection even among mild symptomatic people routinely exposed to these workplace stressors.

High BMI was noted in affected participants which supports the known association between obesity and plantar fasciitis. Excess body weight increases strain on the plantar fascia during walking that leads to degenerative changes at its calcaneal attachment [5]. In this study, plantar fasciitis prevalence increased from 58.1% in normal-weight participants to 80.0% in overweight and 91.7% in obese participants. This pattern is similar to the dose-response relationship reported by Riddle and Schappert [10]. Irving et al. also confirmed that BMI is one of the most consistent factors linked with chronic plantar heel pain in non-athletic populations [11].

Prolonged standing was the strongest predictor in the multivariate model (Adjusted OR: 5.10). Continuous standing places creates repeated stress on the plantar fascia which reduces tissue recovery and promotes small tears [12]. The six-hour threshold seen in this study is similar to the occupational threshold reported by Werner et al. in assembly plant workers [13]. Irving et al. also found moderate evidence linking prolonged standing with chronic plantar heel pain [11].

Lack of intraoperative breaks was independently associated with plantar fasciitis (Adjusted OR: 5.59). This is important because it is a modifiable workplace factor. In operation theatres, long procedures often discourage breaks due to sterility and continuity of surgery. However, planned rest breaks may help reduce fatigue and also protect the plantar fascia [14].

Not using cushioned footwear was another independent predictor (Adjusted OR: 4.35). Reviews have shown that cushioned insoles and anti-fatigue mats reduce discomfort in workers who stand for long periods [15]. Anti-fatigue mats also reduce low back discomfort [16]. Heel cups, heel pads, viscoelastic insoles, rocker-sole shoes, and foot orthoses have all been shown to reduce pain and improve function in plantar fasciitis [17–21]. These findings support the use of cushioned or orthotic footwear for all OT staff.

The mean AOFAS Ankle-Hindfoot Score of 58.89 indicates significant functional limitation in affected participants. Madeley et al. confirmed the validity of this score by showing good response measures and correlation with SF-36 [22]. The Roles and Maudsley Score of 3.10, mainly in the fair-to-poor range which further shows that plantar fasciitis reduces work performance and also their quality of life. Frequent pain-related sick leave also increases institutional burden.

The protective effect of regular physical activity observed in this study is supported by Plesek et al., who found that moderate weekly running reduced the risk of plantar fasciitis compared with inactivity or excessive running [23]. Therefore, regular low-impact exercise can help prevent plantar fasciitis among the study participants.

Plantar fasciitis prevalence was high across all occupational groups—nurses (75.7%), surgeons (73.7%), technicians (71.4%), and anaesthetists (70.0%). This suggests that the common OT environment, standing hours, and footwear are the main causes rather than specific job roles.

Preventive measures should therefore target all OT staff. The Windlass

test used in this study has proven biomechanical validity. Alshami et al. showed that extension of the MTP joint significantly increases plantar fascia strain [24]. Although diagnosis was clinical without imaging, the symptom combination of first-step morning pain, local heel tenderness, and positive Windlass test is accepted in guidelines [25]. Limitations of this study include its cross-sectional design, which cannot prove causation, and its single-centre setting, which may limit generalisability. Furthermore, as participation was voluntary, the likelihood of selection bias cannot be ruled out, as personnel experiencing typical symptoms may have been more persuaded to participate in the study. In addition, certain occupational exposure details were self-reported, which is prone for recall bias and the diagnosis of plantar fasciitis was based on clinical assessment without any imaging confirmation which may have resulted in an overt diagnosis. Future studies should assess new cases after ergonomic interventions and estimate the economic burden on healthcare institutions.

Conclusion

Plantar fasciitis is highly prevalent among operation theatre personnel, affecting nearly three-fourths of this occupationally exposed cohort and causing clinically significant functional impairment as quantified by validated scoring instruments. Prolonged standing exceeding six hours per day, absence of intraoperative rest breaks, and non-use of cushioned footwear are independent and modifiable occupational risk factors. Institutional preventive strategies — including the mandate of viscoelastic footwear, scheduled intraoperative micro-breaks, and the installation of anti-fatigue flooring — are strongly indicated to reduce the musculoskeletal burden on OT personnel.

Conflict of interest

The authors declare that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

Data availability statement

The datasets generated and analysed in this study are available from the corresponding author on reasonable request. They are not publicly shared because they contain sensitive information that could indirectly identify participants.

Ethical Approval

This study has been approved by the Institutional Ethics Committee on Human Subjects, DSMCH, Certificate No. IECHS/IRCHS/DSMCH/Cert/1037, dated 27 January 2026.

Informed Consent

Written informed consent was obtained from all participants after explaining the study procedures, potential risks and benefits. Consent covered both participation and publication of anonymised findings, with assurance of confidentiality and data privacy.

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