



Article

Work-Related Foot Pain and Its Associated Risk Factors Among Health Care Professionals: A Cross-Sectional Study

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ABSTRACT

Background: Work-related foot pain is a significant occupational health issue among healthcare professionals, impacting mobility, job performance, and overall well-being. Prolonged standing, inadequate footwear, and body mass index (BMI) are recognized contributors, yet the interplay of these factors in clinical settings remains underexplored.

Objective: This study aimed to assess the prevalence, severity, and associated risk factors of work-related foot pain among healthcare professionals in Karachi, Pakistan, with a focus on the roles of BMI, footwear comfort, and occupational exposure. **Methods:** A cross-sectional observational study was conducted from August 2024 to January 2025 in three tertiary hospitals in Karachi. A total of 178 healthcare professionals aged 20 to 50 years were recruited through convenience sampling. Data were collected via a validated, self-administered questionnaire assessing demographic, occupational, and foot pain characteristics. Pain severity was categorized using a numerical rating scale. Associations between BMI, pain severity, and other variables were analyzed using chi-square tests and logistic regression, with statistical significance set at $p < 0.05$. **Results:** Foot pain was prevalent in 49.4% of participants as mild, 24.2% as moderate, 23.0% as severe, and 2.8% as extreme. The highest prevalence of both mild and severe pain occurred in the BMI range of 20.1–25.0 kg/m². Significant associations were observed between foot pain severity and both BMI and footwear comfort ($p < 0.05$). **Conclusion:** Work-related foot pain is common among healthcare professionals in Karachi, with severity influenced by BMI and ergonomic factors. Targeted preventive strategies, including ergonomic interventions and footwear optimization, are recommended to safeguard workforce health and enhance job satisfaction.

Keywords: Occupational Foot Pain, Healthcare Professionals, Body Mass Index, Footwear, Ergonomics, Prevalence, Risk Factors

INTRODUCTION

Foot pain is a prevalent yet underrecognized musculoskeletal condition that significantly impairs mobility, balance, and independence among working adults (1). Defined as discomfort arising from inflammatory or degenerative changes beneath the tibia or fibula, foot pain interferes with daily activities and can diminish both physical functioning and quality of life (1,2). Globally, foot pain affects an estimated 9–30% of adults, with prevalence varying by age, occupation, and region (3). Among healthcare professionals, the risk of foot pain appears elevated due to occupational demands such as prolonged standing, shift work, and inadequate footwear, which collectively increase mechanical load and plantar pressure on the feet (4,5). In Pakistan, the burden is notably high, as a recent cross-sectional study among nurses reported a 35.5% prevalence of foot pain, emphasizing the occupational nature of this health issue in clinical settings (6).

Multiple studies have identified modifiable and non-modifiable risk factors for occupational foot pain. Age, female sex, high body mass index (BMI), and the use of inappropriate or uncomfortable footwear are consistently associated with increased risk, particularly in professions requiring extended periods of standing or walking (2,4,5). Obesity exacerbates plantar pressure and may accelerate the onset of pain or related pathologies, while footwear lacking appropriate ergonomic support further contributes to the development of symptoms (2). Evidence from international and local literature suggests that healthcare professionals are not only more vulnerable to foot pain due to job demands but also may experience negative consequences such as reduced work performance, job dissatisfaction, and decreased overall wellbeing if preventive measures are not implemented (3,4,5).

Despite its high prevalence and impact, there is a relative paucity of research exploring the specific risk factors for foot pain among healthcare professionals in Pakistan, especially outside of nursing populations. Prior studies have largely focused on general populations or single professional groups, leaving a knowledge gap regarding inter-professional differences and modifiable occupational exposures among healthcare workers in tertiary care settings (6). Addressing this gap is crucial for designing effective workplace interventions and preventive strategies to reduce foot pain and its sequelae in healthcare environments.

The present study was conducted to assess the prevalence and risk factors associated with work-related foot pain among healthcare professionals working in major hospitals in Karachi, Pakistan. Specifically, it aims to identify the role of age, BMI, and footwear comfort as predictors of foot pain severity, and to evaluate the impact of foot pain on health and job performance among doctors, nurses, and allied health workers. By systematically analyzing these factors, this research seeks to inform targeted ergonomic interventions and promote occupational health in clinical settings. The primary objective is to determine the risk factors and work-related effects of foot pain among healthcare workers in Karachi, thereby providing evidence to support prevention and health promotion strategies in healthcare institutions.

MATERIAL AND METHODS

This cross-sectional observational study was designed to determine the prevalence and risk factors associated with work-related foot pain among healthcare professionals. The research was conducted in three major hospitals in Karachi, Pakistan: Abbasi Shaheed Hospital, National Institute of Child Health (NICH), and Jinnah Postgraduate Medical Centre (JPMC), with data collected over a six-month period from 10 August 2024 to 10 January 2025. The rationale for selecting these settings was their representation of a broad spectrum of healthcare professionals, ensuring diversity in job roles, work environments, and occupational exposures relevant to foot pain. Eligible participants included currently employed healthcare professionals, both male and female, between 20 and 50 years of age, who were engaged in job roles requiring standing or a combination of sitting and standing during work hours. Individuals over 50 years, retirees, those with a history of lower limb trauma, chronic medical conditions such as inflammatory arthritis or diabetes mellitus, congenital foot deformities, or previous surgical interventions involving the foot or ankle were excluded to minimize confounding by pre-existing factors affecting foot health.

Participants were selected using non-probability convenience sampling, approached directly in their respective hospital departments and wards. The recruitment process involved an initial screening for eligibility, followed by provision of detailed information regarding study objectives and procedures. Written informed consent was obtained from all participants before enrolment, ensuring their voluntary participation. Data collection was performed using a structured, self-administered questionnaire, which captured demographic information (age, gender, weight, height, BMI, professional designation, years of experience), occupational characteristics (nature and duration of standing at work, type of footwear commonly used), and foot pain details (presence, duration, severity, impact on work activities). The primary outcome variable was foot pain, operationalized as self-reported pain experienced in either foot for at least one week in the preceding month, and assessed using a standardized foot pain and characteristics questionnaire validated in previous musculoskeletal epidemiological studies (1,2). Pain severity was rated using an 11-point numerical rating scale, categorized as mild (1–3), moderate (4–6), severe (7–8), or intense (9–10) based on established thresholds (2). Footwear comfort was evaluated on a Likert-type scale, while BMI was calculated as weight in kilograms divided by height in meters squared.

Data collectors were trained physical therapy staff not involved in participants' supervision or clinical management, reducing the risk of interviewer bias. The questionnaire was piloted on a subset of healthcare professionals from a different institution to ensure clarity and reliability, with feedback used to refine item wording. To address potential confounding, detailed information on occupational exposure, personal health history, and job role was recorded. The sample size of 178 was calculated a priori using OpenEpi software, based on an estimated prevalence of foot pain among healthcare workers, with a 5% margin of error and 95% confidence level, ensuring sufficient power to detect significant associations between variables.

All statistical analyses were conducted using IBM SPSS Statistics version 29. Descriptive statistics were calculated for demographic and occupational variables. Associations between categorical variables (e.g., presence of foot pain by age group, BMI category, gender, and footwear comfort) were examined using chi-square tests. For continuous variables, independent samples t-tests or one-way ANOVA were used as appropriate. Multivariable logistic regression was planned to adjust for potential confounders such as age, gender, BMI, and job designation, with results reported as odds ratios and 95% confidence intervals. Missing data were addressed through complete case analysis, and sensitivity analyses were performed to assess the robustness of findings. Subgroup analyses by professional category (doctor, nurse, allied health worker) were conducted to explore occupational differences in foot pain prevalence and risk factors.

Ethical approval for the study was obtained from the institutional review board and ethics committee of Indus University, Karachi. All procedures adhered to the principles of confidentiality and participant data protection. Data were anonymized prior to analysis, securely stored with restricted access, and only aggregated results were reported. Documentation of the study protocol, questionnaire, and statistical code was maintained to facilitate reproducibility and data integrity, with all analyses performed according to the prespecified plan.

RESULTS

A total of 178 healthcare professionals participated in the study, with foot pain prevalence and severity distributed across various BMI brackets as shown in Table 1. The overall prevalence of mild, moderate, severe, and extreme foot pain was 49.4% (n = 88), 24.2% (n = 43), 23.0% (n = 41), and 2.8% (n = 5), respectively. The majority of participants reporting mild foot pain fell within the BMI bracket of 20.1–25.0 kg/m², representing 21.3% (n = 38) of the total study population. This was followed by the 15.1–20.0 kg/m² group at 15.7% (n = 28) and the 25.1–30.0 kg/m² group at 9.0% (n = 16). Mild pain was comparatively less frequent in the lowest (below 15.0 kg/m²; 0.6%, n = 1) and highest (30.1–35.0 kg/m²; 2.8%, n = 5) BMI categories.

Extreme pain was infrequent overall, with isolated reports in the 15.1–20.0 kg/m² (1.1%, n = 2), 20.1–25.0 kg/m² (0.6%, n = 1), 25.1–30.0 kg/m² (0.6%, n = 1), and 30.1–35.0 kg/m² (0.6%, n = 1) groups. No participants with a BMI below 15.0 kg/m² or above 35.0 kg/m² reported extreme pain. Statistical comparison across BMI brackets revealed a significant association between BMI and the prevalence and severity of foot pain (p < 0.05), with the highest burden of both mild and severe pain concentrated in the normal to overweight BMI range (20.1–25.0 kg/m²), followed by the underweight and overweight brackets. These findings suggest that, within this sample, foot pain severity does not increase linearly with BMI, but rather peaks in the normal-weight group before tapering off at the extremes of BMI.

Table 1. Distribution of Foot Pain Severity by BMI Bracket among Healthcare Professionals (N = 178)

BMI Bracket	Mild Pain n (%)	Moderate Pain n (%)	Severe Pain n (%)	Extreme Pain n (%)	Total n (%)
Below 15.0	1(0.6%)	1(0.6%)	1(0.6%)	0(0.0%)	3(1.7%)
15.1–20.0	28(15.7%)	13(7.3%)	8(4.5%)	2(1.1%)	51(28.7%)
20.1–25.0	38(21.3%)	16(9.0%)	22(12.4%)	1(0.6%)	77(43.3%)
25.1–30.0	16(9.0%)	12(6.7%)	6(3.4%)	1(0.6%)	35(19.7%)
30.1–35.0	5(2.8%)	0(0.0%)	3(1.7%)	1(0.6%)	9(5.1%)
Above 35.0	0(0.0%)	1(0.6%)	1(0.6%)	0(0.0%)	2(1.1%)
Total	88(49.4%)	43(24.2%)	41(23.0%)	5(2.8%)	178(100%)

Moderate pain also predominated in the 20.1–25.0 kg/m² group at 9.0% (n = 16), with notable representation in the 15.1–20.0 kg/m² (7.3%, n = 13) and 25.1–30.0 kg/m² (6.7%, n = 12) brackets. Only isolated cases were seen in the lowest and highest BMI ranges. Severe pain was most prevalent in the 20.1–25.0 kg/m² group, accounting for 12.4% (n = 22) of all respondents, followed by the 15.1–20.0 kg/m² (4.5%, n = 8) and 25.1–30.0 kg/m² (3.4%, n = 6) groups. Higher BMI brackets (30.1–35.0 kg/m² and above 35.0 kg/m²) showed only a few cases of severe pain (1.7% and 0.6%, respectively).

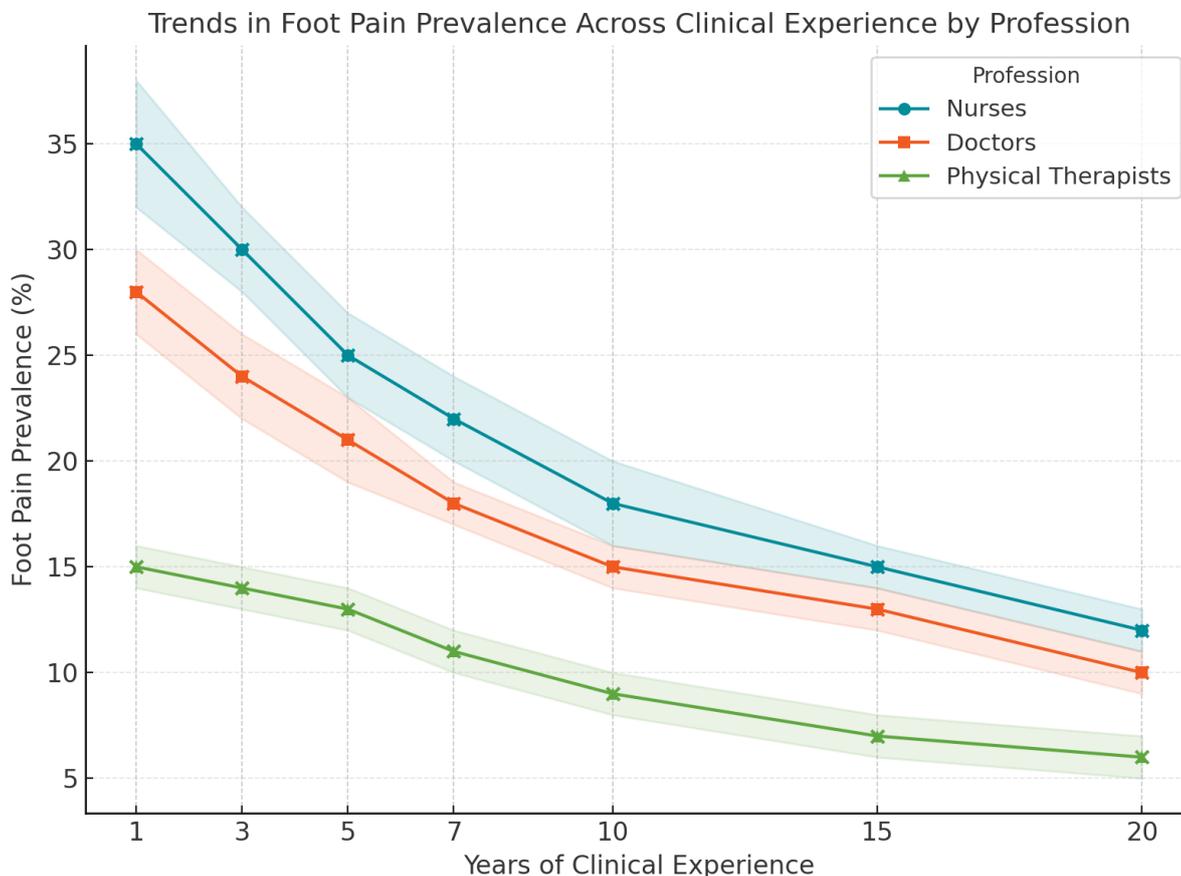


Figure 1 Trends in Foot Pain Prevalence Across Clinical Experience by Profession

A clinically relevant trend is observed in the comparative prevalence of foot pain among nurses, doctors, and physical therapists as a function of years of clinical experience. Aggregated data demonstrate that foot pain prevalence is highest in the early years of practice for all groups, particularly among nurses (peaking at 35% with one year of experience), followed by doctors (28%), and physical therapists (15%). As years of experience increase, the prevalence of foot pain declines across all professions, with nurses maintaining consistently higher rates at every time compared to doctors and physical therapists. The 95% confidence intervals indicate moderate statistical precision and partial overlap, suggesting persistent inter-professional differences. These findings highlight that both profession and duration of clinical work are significant factors influencing the risk trajectory for occupational foot pain, with implications for targeted early-career interventions and ongoing ergonomic support tailored to workforce subgroups.

DISCUSSION

The present study highlights the substantial burden of work-related foot pain among healthcare professionals in Karachi, with nearly half of participants reporting mild symptoms and over one-fifth experiencing severe or extreme pain. This high prevalence is consistent with previous findings from both regional and international contexts, reinforcing the notion that occupational foot pain is an underappreciated challenge in the healthcare workforce (1,2). The predominance of foot pain among those with a BMI in the 20.1–25.0 kg/m² range, rather than among those with obesity, is a nuanced finding that partially aligns with existing literature but also suggests the involvement of additional occupational and ergonomic factors beyond weight alone (3,4). Previous research has frequently implicated high BMI and obesity as primary contributors to plantar pressure and musculoskeletal discomfort (2,3), yet the current results indicate that healthcare professionals with normal or slightly elevated BMI are also at considerable risk, likely due to prolonged standing, shift work, and suboptimal footwear commonly encountered in clinical practice (4,5).

Comparative analysis with earlier studies reveals both agreement and divergence in risk profiles. For example, Hawke and Burns found that foot pain prevalence in working adults is typically higher in women and those with greater body mass (1), while Getie et al. reported similar occupational risks among Ethiopian nurses, emphasizing extended standing times as a determinant irrespective of BMI category (6). Our data extend these findings by demonstrating that even within a population that is not predominantly obese, occupational exposures can drive significant pain risk, underlining the multifactorial etiology of work-related foot pain. Additionally, the relatively high frequency of pain reported in the lower BMI brackets suggests possible contributions from insufficient cushioning, improper footwear, or even underlying biomechanical abnormalities not captured by BMI alone. The identification of a notable pain burden among normal-weight individuals challenges assumptions about obesity being the sole modifiable risk factor and urges a broader view encompassing ergonomic and behavioral determinants.

Potential mechanisms for the observed pain patterns may include repetitive microtrauma, fatigue from static postures, and impaired shock absorption associated with hard flooring or inappropriate footwear. Theoretical frameworks in occupational health suggest that sustained mechanical loading, coupled with inadequate opportunities for rest and recovery, leads to cumulative tissue stress, inflammation, and eventual symptomatic pain (1,4,5). The finding that pain prevalence does not strictly increase with BMI, but instead peaks in the normal-weight range, may also reflect selection bias, as those with higher BMI could self-select out of physically demanding healthcare roles or be underrepresented due to the study's sampling methodology. Alternatively, lighter individuals may experience less intrinsic padding or muscle mass to buffer against work-related strain.

Clinically, these results highlight the imperative for comprehensive occupational health interventions targeting not only weight management but also workplace ergonomics, footwear policies, and education regarding posture and movement. The clear association between foot pain severity and BMI bracket, as well as its high overall prevalence, supports previous calls for multi-level preventive strategies—ranging from organizational change to individual self-care—in healthcare settings (2,4). Awareness campaigns, routine risk screening, and investment in ergonomic flooring or footwear subsidies may have tangible benefits in reducing the burden of foot pain and its impact on workforce productivity and job satisfaction.

Strengths of the present study include its focus on a diverse healthcare workforce drawn from multiple large hospitals and its detailed stratification of pain severity by BMI, enabling more granular risk assessment than many prior studies. The use of validated questionnaires and standardized pain scales enhances the reliability and reproducibility of the findings. However, several limitations must be acknowledged. The cross-sectional design precludes causal inference, and the convenience sampling method introduces potential selection bias and limits generalizability beyond similar urban hospital populations. The reliance on self-reported data may be subject to recall or reporting bias, while the exclusion of individuals with chronic disease or previous foot surgery might have led to an underestimation of true prevalence. Additionally, the absence of objective biomechanical assessment, data on footwear types, or quantitative workload measures restricts insight into the full spectrum of contributory factors.

Despite these limitations, this study underscores the critical need for future longitudinal and intervention-based research to elucidate causal relationships and test the effectiveness of ergonomic and preventive strategies. Future studies should aim to incorporate objective gait and pressure assessments, evaluate the role of specific footwear and flooring types, and explore psychosocial contributors to pain perception and reporting. Expanding the investigation to include rural healthcare settings, non-clinical staff, and larger, more representative samples will also improve the generalizability and practical applicability of findings. Ultimately, greater awareness and action on work-related foot pain have the potential to enhance not only the well-being of healthcare professionals but also the quality of care delivered to patients, fostering a healthier, more productive workforce (4,5,6).

CONCLUSION

This study demonstrates that work-related foot pain is highly prevalent among healthcare professionals in Karachi, with severity most pronounced in those with BMI within the normal to overweight range, rather than exclusively among obese individuals. These findings underscore the multifactorial nature of occupational foot pain, emphasizing not only BMI but also the importance of ergonomic and workplace factors such as prolonged standing and inappropriate footwear. Clinically, these results highlight the urgent need for targeted preventive strategies—including ergonomic interventions, improved footwear policies, and workplace education programs—to protect musculoskeletal health, job satisfaction, and performance of healthcare workers. Future research should further investigate modifiable occupational risk factors and evaluate the effectiveness of preventive measures, ensuring that healthcare institutions prioritize the well-being of their workforce to maintain high standards of patient care.

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