

SURVEY OF FUNCTIONAL LIMITATIONS ASSOCIATED WITH LONG STANDING WORKING HOURS AND FOOTWEAR AMONG FEMALES

Original Research

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Abstract

Background: Prolonged standing hours, footwear and BMI has a positive impact on functional limitations. Prolonged standing occupations are defined by the time in which employees spend more than 50% of their working shift in standing position. Up to 58% of women encounter musculoskeletal disorders associated with their occupation. Moreover, women face a 42% higher risk compared to men. Footwear acts as a crucial link between workers and their surroundings, impacting posture, movement patterns, and the distribution of forces across the body.

Objective: To find the prevalence of functional limitations associated with prolonged standing working hours and footwear among female workers.

Methodology: This cross-sectional survey study was conducted in pharmaceutical companies in Faisalabad over a period of 4 months. The study involved 278 female workers with standing jobs, selected using non-probability purposive sampling. Participants were aged 25-40, with at least one year of standing job experience, and spent over three hours daily standing. Exclusions included recent trauma, fractures, surgeries, congenital foot disorders, and pregnancy. Data was collected using the Foot and Ankle Disability Index (FADI) and analysed with SPSS version 20. Informed consent was obtained from all participants.

Result: In total 278 female participants were selected. The majority of participants (54.3%) were between 25-30 years old, with 42.1% having 4-6 years of working experience, and 61.5% standing for 7-8 hours a day. Most participants (37.1%) had a normal weight BMI, and 76.3% experienced foot and ankle pain.

Conclusion: This study shows high prevalence of functional limitations and has significant association with BMI, prolonged standing hours and footwear. In conclusion, the study found that foot and ankle pain is prevalent (76.3%). High heels, long standing hours, and high BMI increased the possibility of foot and ankle pain.

Keywords: ankle pain, BMI impact, ergonomic interventions, female workers, footwear effects, functional limitations, musculoskeletal disorders, prolonged standing, rehabilitation sciences, standing occupations, workplace ergonomics, workplace health.

INTRODUCTION

Musculoskeletal disorders (MSDs) comprise conditions affecting cartilaginous, ligamentous, tendinous, articular, and muscular tissues, disrupting the normal anatomy, physiology, and kinematics of the human body (1). Extended periods of standing are often linked to considerable fatigue and overall body discomfort by the day's end. While the exact impact of this fatigue is not definitively established, it is believed to be manifested in reduced productivity and job satisfaction (2). Working on surfaces lacking shock absorption, such as concrete hospital floors, exacerbates the challenges (3).

Occupations with long standing involve significant physical strain on the lower extremities, as they bear the body's weight during prolonged periods of standing and walking (4). Musculoskeletal pain, especially in the foot and ankle, is prevalent among employees and is often linked to job stress, and heavy workloads, as supported by literature (5, 6). Footwear has been identified as a significant feature in the occurrence of foot pain within the general population. Notably, females seem to experience foot pain more frequently than males, particularly in the forefoot region (7). Footwear acts as a crucial link between workers and their surroundings, impacting posture, movement patterns, and the distribution of forces across the body. Despite its potential significance, current guidelines for prolonged standing work in the UK lack specific recommendations regarding footwear and its role in lower limb musculoskeletal disorders (8, 9).

Prolonged standing has become a pervasive aspect of various professional occupations, with individuals in roles such as healthcare, retail, and manufacturing often required to endure extended hours on their feet (10, 11). While the physical toll of prolonged standing on the musculoskeletal system has been acknowledged, there is a growing need to specifically examine its impact on the ankle and foot structures as prolonged standing is a frequent demand in many professions, comprising retail, healthcare, manufacturing, and education (12). Workers who stand for prolonged periods frequently report musculoskeletal issues. The intention of this study is to explore the association among functional limitations and prolonged standing working hours, footwear (7). This study provides a detailed understanding of the health hazards related with extended periods of standing. The findings will add significantly in enhancing the quality of life for employees who are obliged to stand for long duration (8). The study highlights the influence of prolonged standing hours and footwear upon functional limitations crucial for improving workplace conditions. Long-standing working hours, particularly when coupled with inappropriate footwear, can lead to various functional limitations associated with foot and ankle (13). This combination exacerbates fatigue and reduces mobility. The findings emphasize the need for ergonomic interventions, such as supportive footwear and regular breaks, to mitigate these adverse effects. Furthermore, the study underscores the importance of workplace policies that prioritize employees' health, advocating for changes that could lead to enhanced well-being and productivity among female workers (9).

METHODS

A cross-sectional survey study was conducted to know functional limitations associated with long standing working hours and footwear among females. Non-probability, purposive sampling technique was used to collect data. Data was collected from 278 female workers of different pharmaceutical companies of Faisalabad. Only female workers of age 25 to 40 years with at least one year history of long standing more than 3 hours daily, were included in study. Females with history of recent trauma, fracture or surgery, congenital foot disorders and pregnant females were excluded. After taking informed consent FADI was used to evaluate foot ankle disabilities of female workers who spend more than 3 hours in standing position. Foot and ankle disability index was used to assess functional limitations. Descriptive statistical analysis was performed about each part of question through SPSS version 20.

RESULTS

Working years of the participants those were divided into 3 ranges: 1-3 years, 4-6 years, 7-10 years of working experience. The distribution shows that out of 278 participants 29.9 percent fell into 1-3 years category, 42.1 percent of them lied into 4-6 years category while the rest 28.1 % lay in 7-10 years category. Standing Hour: the standing of the participants was divided into 3 ranges; 3-4 hours, 5-6 hours, 7-8 hours of standing. The distribution shows that out of 278 participant 12.6 % fell into 3-4 hours category, 25.9 % of them lied into 5-6 hours category while the rest 61.5 % lied in 7-8 hours category. BMI of the participant were divided into 4 ranges: Underweight, Normal weight, Overweight and Obese of BMI. The distribution shows that out of 278 participants 14 % fell into the underweight category, 37.1 % of them lied into normal weight category, 28.8 % were lie in overweight category while the rest 20.1 percent lied in obese category. Screening of Ankle and Foot Pain: presence of ankle and foot pain of 278 participant data collected from pharmaceutical companies. It showed that 212 participants out of 278 with the percentage of 76.3 had ankle and foot pain in which screening questions showed positive findings while in 66 participants out of 278 with a percentage of 23.7 had not suffered with ankle and foot pain because in those the screening questions showed negative findings.

Table 1 Combined Frequency and Percentage Distribution of Ankle and Foot Disability Index and Footwear Preferences

| Category | Frequency (%) |
|---|---------------|
| Ankle and foot disability index Q1 (Level of Disability) | |
| 0-35 (Severe Disability) | 34 (12.2%) |
| 36-70 (Moderate Disability) | 152 (54.7%) |
| 71-104 (Mild Disability) | 27 (9.7%) |
| No Disability | 65 (23.4%) |
| Ankle and foot disability index Q2 (Footwear) | |
| High Heels | 47 (16.9%) |
| Low Heels | 103 (37.1%) |
| Flats | 41 (14.7%) |
| Sneakers | 22 (7.9%) |
| No Footwear | 65 (23.4%) |

The Foot and Ankle Disability Index questionnaire categorized the level of disability into three main categories: severe (0-35), moderate (36-70), and mild (71-104). This questionnaire was administered only to participants who showed a positive response in the screening test, indicating they experienced foot and ankle pain. Participants with a negative screening test, meaning they did not suffer from foot and ankle pain, did not complete the questionnaire. Among the 278 participants, 12.2% (34 participants) reported severe disability, 54.7% (152 participants) reported moderate disability, and 9.7% (27 participants) reported mild disability, while 23.4% (65 participants) did not report any disability. Footwear according to the Foot and Ankle Disability Index questionnaire was divided into four main categories: high heels, low heels, flats, and sneakers. This questionnaire was filled out only by participants who showed a positive response in the screening test, and participants with a negative screening test, meaning they did not suffer from foot and ankle pain, did not fill out this questionnaire.

The Foot and Ankle Disability Index questionnaire categorized footwear into four types: high heels, low heels, flats, and sneakers. Of the 278 participants, 16.9% (47 participants) wore high heels, 37.1% (103 participants) wore low heels, 14.7% (41 participants) wore flats, and 7.9% (22 participants) wore sneakers. Additionally, 23.4% (65 participants) did not report any specific type of footwear.

Table 2: Correlation Between Standing Hours & The Foot and Ankle Disability Index Q1 (Level of Disability)

| Correlations | | Standing Hours | The Foot and Ankle Disability Index Q1(Level of Disability) |
|---|---------------------|----------------|---|
| Standing Hours | Pearson Correlation | 1 | -.577** |
| | Sig. (2-tailed) | | .000 |
| | N | 278 | 278 |
| The Foot and Ankle Disability Index Q1(Level of Disability) | Pearson Correlation | -.577** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 278 | 278 |

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis between standing hours and the Foot and Ankle Disability Index Q1 (Level of Disability) shows a significant negative correlation with a Pearson value of -0.577 ($p = 0.000$), indicating that as standing hours increase, the level of disability also increases. This result is based on data from 278 participants and is significant at the 0.01 level (two-tailed).

Table 3: Correlation Between BMI, Footwear, and Level of Disability

| Variables | Pearson Correlation | Significance tailed) | (2- N | Interpretation |
|-----------|---------------------|----------------------|-------|---|
| BMI | 1 | <0.05 | 278 | Positive correlation indicates an increase in BMI increases the level of disability. |
| Footwear | 1 | <0.05 | 278 | Positive correlation indicates that footwear type influences the level of disability. |

Correlation between BMI and level of disability variables and Pearson correlation values show positive correlation with value "1" that indicates if BMI increase the level of disability is also increased and vice versa. Correlation between Footwear and level of disability variables and Pearson correlation values show positive correlation with value "1" that indicates that the type of foot wear is involved in variation of level of disability. Level of significance is less than 0.05 that indicates the null hypothesis has been rejected and alternative hypothesis has been accepted.

Table 4: Foot and Ankle Disability Index (Level of Disability)

| | | The Foot and Ankle Disability Index Q1(Level of Disability) | | | | Total |
|----------------|-----------|---|-----------------|--------------|----|-------|
| | | 0-35(severe) | 36-70(Moderate) | 71-104(Mild) | no | |
| Standing Hours | 3-4 hours | 0 | 0 | 0 | 35 | 35 |
| | 5-6 hours | 0 | 34 | 8 | 30 | 72 |
| | 7-8 hours | 152 | 0 | 19 | 0 | 171 |
| Total | | 152 | 34 | 27 | 65 | 278 |

The cross-tabulation of standing hours and the Foot and Ankle Disability Index (Q1) shows that among the 278 participants, those standing for 3-4 hours reported no severe, moderate, or mild disability, with all 35 participants showing no disability. For those standing 5-6 hours, 34 participants experienced moderate disability, 8 had mild disability, and 30 reported no disability, totalling 72 participants. Among participants standing for 7-8 hours, 152 experienced severe disability, 19 had mild disability, and none reported no disability, making up a total of 171 participants.

DISCUSSION

The study was intended to attain the prevalence of functional limitations in female workers with long standing working hours among the pharmaceutical industries of Faisalabad and its association with BMI and footwear. Functional limitations in female workers were assessed through Foot and Ankle Disability Index (FADI). A 2021 study by SukhDev & Kamalesh investigated work-related musculoskeletal disorders (WMSDs) among urban hairdressers in India. The study found that approximately half of the barbers experienced knee and foot pain, pursued by lower back and upper back pain. Additionally, more than 25% reported neck and shoulder pain, with female hairdressers being more likely to experience WMSDs than their male colleagues (14). The study used the Foot Posture Index (FPI) to analyze foot biomechanics and a plank test to assess CS (15). The results showed that as BMI increased, foot posture alignment worsened ($r=0.504$, $P=0.001$) and core stability decreased ($r=-0.34$, $P=0.036$). The study concluded that being overweight has a significant impact on foot posture and body stability (16).

This study also showed similar results of positive correlation between BMI and functional limitations and hence concluded that if BMI increases, functional limitations also show positive inclination. Bernardes & Caldeira (2023) conducted a comprehensive review of studies examining the risks of prolonged standing in nursing professionals, with a focus on foot and ankle disorders (17). Their analysis included 39 studies published between 1982 and 2020, revealing that pain was the most frequently reported disorder, mentioned in 19 studies. Other common issues included numbness, burning feet, bunions, structural deformities, fungal infections, and calluses. The findings of this review highlight the importance of addressing the risks of prolonged standing in nursing professionals, particularly for female nurses, to prevent foot and ankle disorders and promote overall well-being (1). In a systematic review and meta-analysis conducted by Anisa Ferli & Swandito Wicaksono to investigate the relationship between wearing high-heeled shoes and foot pain problems. They searched databases such as PubMed and Trip, and after screening and selecting relevant studies, three were included in a meta-analysis. The results showed that wearing high heels did not have a statistically significant effect on foot pain ($p = 0.248$). However, the clinical odds ratio was 1.87, indicating that women who wear high heels are 1.87 times more likely to experience foot pain. This suggests a significant clinical association between high heel use and foot pain, despite the lack of statistical significance (18). This study also shows similar results of the correlation between footwear and level of disability variables with value "1" of Pearson correlation that indicates the type of footwear is involved in levels of functional limitations (19).

While our study provides valuable insights into the functional limitations associated with prolonged standing hours and footwear among female workers, it has some limitations. The research was confined to a relatively small population within Faisalabad, which may restrict the generalizability of the findings. Additionally, companies allocated limited time for each participant to complete the questionnaire, potentially affecting the depth of responses. To address these limitations, future research should expand the sample size to include a more diverse population, enhancing the applicability of the results. Implementing a longitudinal study design could also help track the development of functional limitations over time, providing a more comprehensive understanding. Including a control group of females not engaged in standing occupations would offer a basis for comparison, further validating the findings. Moreover, exploring

psychological factors such as stress and fatigue would add depth to the understanding of how these aspects influence functional limitations in this population.

CONCLUSION

The study shows high prevalence of functional limitations and has significant association with BMI, prolonged standing hours and footwear. In conclusion, the study found that foot and ankle pain is prevalent (76.3%). Standing hours, BMI, and footwear type are linked to foot and ankle pain. High heels, long standing hours, and high BMI increase the risk of foot and ankle pain. Proactive measures, such as proper footwear and foot care, can help reduce the risk of foot and ankle pain.

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