Journal of
Social & Health Sciences

LOGIXS JOURNALS

Original Article

Ankle sprain risk and contributing factors among women wearing high heels at work

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Citation: Babar S, Hafeez A, Rana MO, Tabassum I, Ali M, Asghar R. Ankle sprain risk and contributing factors among women wearing high heels at work. J Soc Health Sci. 2024;3:14-25.

Received: 20 June 2024
Revised: 11 December 2024
Accepted: 27 December 2024
Published: 31 December 2024

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Abstract

High heel use in professional environments is a common occupational norm for women, particularly in the hospitality, retail, and fashion industries. However, extended and repetitive use may increase the risk of ankle injuries. The objective of this exploratory study was to examine the factors associated with a history of ankle sprain among women wearing high heels at work. A total of 203 participants were recruited from selected workplaces in Lahore, Pakistan, via a nonprobability convenience sampling technique. Data were collected through a structured questionnaire assessing sociodemographic information, footwear usage patterns, pain symptoms, occupational standing duration, and ankle sprain history. Chi-square analysis revealed significant associations between ankle sprains and heel height, duration of heel wear, type of heel, workplace footwear requirements, and the presence of pain during high heel use ($p < 0.05$). Women wearing heels ≥ 10 cm and those wearing stilettos were more likely to report a history of ankle sprain. Logistic regression analysis revealed that standing more than 4 hours per day (OR = 3.803), footwear requirements at work (OR = 3.534), and pain during heel use (OR = 9.893) significantly increased the odds of experiencing an ankle sprain, whereas increasing age (OR = 0.789) and being married (OR = 0.304) were associated with lower risk ($p < 0.05$). Ankle sprains led to productivity loss in more than 75% of the participants, with the majority missing 1–5 workdays. These findings highlight the occupational health risks of high heel use, with prolonged standing, footwear mandates, and early pain symptoms identified as key predictors of injury. Implementing preventive workplace measures—such as ergonomic footwear policies, scheduled standing breaks, and employee education—may help reduce ankle injury risk among women in professions requiring high heels.

Keywords

Ankle injuries; Risk factors; Shoes; Heel; Occupational health; Women, working

1. Introduction

Ankle sprain is one of the most frequently encountered musculoskeletal injuries and typically involves a partial or complete tear of one or more ligaments of the ankle joint, most often affecting the lateral ligament complex [1]. These injuries are common in both sports and daily activities, with an estimated incidence of 1.94 per 1,000 adolescents annually [2,3]. Inadequate or delayed management of acute ankle sprains may result in chronic ankle instability and a greater likelihood of recurrent injury episodes [4]. Young adult females, especially those in their teens and twenties, have been identified as a high-risk group, a trend often attributed to the frequent use of high-heeled shoes (HHSs) within this population [5].

High-heeled footwear is widely worn by women for aesthetic and occupational reasons, with more than half of female users reporting regular use [6]. These shoes modify lower limb biomechanics by elevating the heel, causing a forward shift in the body's center of gravity and compromising postural stability [7]. Studies have demonstrated that increasing heel height results in greater plantar flexion and inversion moments during gait, which predisposes individuals to lateral ankle sprains [8]. In addition, HHSs reduce stride length and impair muscular coordination, leading to further instability while walking [9]. Prolonged usage, such as wearing high heels for at least 5 hours per day on three or more days per week, may induce neuromuscular changes and alter pressure distribution across the foot and ankle, thereby compounding the risk of injury [10,11].

While several studies have addressed the biomechanical consequences of high heel use, focused research examining specific heel-related parameters and their direct associations with ankle sprain incidence, particularly in occupational settings, is lacking. Retrospective data from the United States reported more than 123,000 high heel–related injuries between 2002 and 2012, most of which involved the foot or ankle during nonsport activities [12]. In the Pakistani context, a study reported that 54% of female respondents had experienced ankle sprains, with a significant association between BMI and ankle injury ($p = 0.014$) [13]. The same study highlighted that heel-related variables, such as height and shoe style, were relevant contributing factors. Nonetheless, workplace-related exposure to high heels—including heel height, type, and wear duration—remains relatively underexplored [14,15,16].

In professional settings characterized by formal dress codes—such as hospitality, retail, and corporate environments—women are often required to wear high heels for extended periods. Prolonged exposure to such footwear may serve as a key occupational risk factor for ankle injuries. Despite this, empirical data addressing occupational risks associated with high heel use are sparse [16,17]. A recent review emphasized the adverse effects of high heels on gait and balance and stressed the need for preventive interventions tailored to workplace settings [18].

In light of these gaps, the objectives of this study are to examine the factors associated with ankle sprains among women wearing high heels in occupational settings; to explore the relationships between heel-related characteristics such as heel height, type of heel, and duration of wear and the occurrence of ankle sprains; to assess pain-related symptoms, balance issues, and confidence during high heel use; to evaluate occupational influences such as standing duration and footwear requirements on ankle injury risk; and to identify significant predictors of ankle sprain history through binary logistic regression analysis. These findings can inform evidence-based recommendations for minimizing occupational ankle injuries among women who wear high heels.

2. Methods

2.1. Study design and duration

An exploratory study design was employed and carried out over a period of three months, from June to August 2023.

2.2. Ethics approval

Prior to data collection, ethical approval was obtained from the Ethics Review Committee (ERC) of Hussain College of Health Sciences, Lahore, Pakistan (No. HCHS/2023/ERC/31). Written informed consent was obtained from all participants, and the confidentiality of their responses was ensured throughout the study.

2.3. Sample size calculation and sampling technique

The required sample size was estimated via the OpenEpi online sample size calculator, which assumes a 95% confidence level and a 5% margin of error. The calculation was based on a previously reported prevalence of 84.4% HHS usage among working women in a study conducted in Lahore [14]. The estimated sample size was 203. A nonprobability convenience sampling technique was adopted to recruit participants who met the eligibility criteria.

2.4. Study setting and population

The survey was conducted in Lahore, Pakistan, with a particular focus on the tourism and hospitality sector as well as the fashion and retail industry, given the high concentration of female employees within these domains and the relevance of high occupational heel use within these professional environments. For the tourism and hospitality sector, three major hotels—Avari Express Hotels, Pearl Continental Hotel, and Nishat Hotel—were selected. In the fashion and retail sector, selected outlets of leading brands, including Gul Ahmed, Breakout, and Khaadi, were included for data collection.

2.5. Inclusion and exclusion criteria

Women employed in the tourism and hospitality or fashion and retail sectors were eligible for inclusion if they were between 18 and 35 years of age, had a minimum of one year of occupational experience, and regularly wore high heels for at least one hour and up to a maximum of eight hours per shift, with five to six working days per week. Participants were excluded if they had a history of ankle surgery, recent lower limb conditions affecting balance or gait, or any prior lower limb fractures that could introduce structural bias. Additionally, individuals who did not provide informed consent or who expressed an unwillingness to participate were excluded from the study.

2.6. Data collection tool and procedure

Data were collected via a structured, self-administered questionnaire that was developed on the basis of an in-depth review of the literature and by adopting relevant content from previous studies on high heel usage and musculoskeletal health among working women [19,20,21].

The first section, sociodemographic indicators, included questions on age (in years), education level (in years), marital status (single, married), occupation (retail/sales associate, customer service officer, hospitality staff, fashion industry professional, office/administrative staff, executive/managerial, other), monthly household income (in PKR), and locality (rural or urban).

The second section, footwear preferences and usage patterns, captured participants' preferred footwear type (heeled or flat), frequency of high heel use (yes, no, or occasionally), preference for wearing heels on special occasions (yes/no), awareness of potential harmful effects of high heel use, continued usage despite awareness (yes, no, sometimes), and the most frequently performed activity while wearing high heels (standing, walking, sitting). This section also explored the duration of high heel use per shift (< 3 hours to ≥ 6 hours), type of heels commonly worn (wedge, block, stiletto, platform), heel height category (3 cm, 5 cm, 7 cm, ≥ 10 cm), and confidence associated with wearing high heels (yes/no).

The third section, pain and discomfort related to high heel use, focused on pain-related experiences. It included the self-reported presence and severity of pain experienced during or after wearing high heels (none, mild, moderate, severe), specific activi-

ties that worsen pain (e.g., prolonged standing, walking on hard or uneven surfaces, lifting while walking, brisk walking, or involvement in workplace duties), frequency of morning foot pain (never, occasionally, every day), and the degree to which pain impacts activities of daily living (no impact to severely limited). It also addressed whether participants avoided long-distance walking in heels and whether they perceived imbalance during high heel use.

The fourth section, work environment and requirements, inquired about the number of working days per week, average standing duration per shift (< 2 hours to > 6 hours), and whether specific types of footwear were required for their job roles. If so, participants were asked to specify whether high heels, safety shoes, or other footwear types were mandated.

The fifth section, ankle sprain history and outcomes, assessed whether participants had a history of ankle sprain (yes/no), type of sprain (inversion/eversion), and perceived cause (e.g., walking on uneven surfaces, slipping, sudden twisting, use of stairs, workplace hazards). The section also gathered information on the recurrence of sprains, frequency of sprains while wearing high heels at work (frequently, occasionally, rarely, never), healing time (less than a week to more than 4 weeks), occurrence of sprains in the past year, whether medical treatment was sought, and number of workdays or productivity lost due to ankle sprains (no impact, 1–5 days, 6–10 days, more than 10 days).

Eligible participants were approached at their workplaces, and upon providing informed consent, the questionnaires were distributed in person during working hours to minimize workplace disruption. The participants were briefed regarding the purpose of the study as well as instructions to complete the questionnaire by the principal investigator, and all completed responses were collected anonymously with the intent of maintaining participant confidentiality.

For binary logistic regression analysis, standing duration per shift was dichotomized into two categories: less than 4 hours and 4 hours or more.

2.7. Data analysis

Data analysis was conducted using Statistical Package for Social Sciences software (SPSS version 26, SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to summarize participant characteristics, footwear use patterns, pain symptoms, and ankle sprain history. A chi-square test was applied to assess associations between heel-related and occupational factors and a history of ankle sprain. Binary logistic regression was further used to identify significant predictors of an ankle sprain history on the basis of selected demographic, footwear, and occupational variables. A p value of less than 0.05 was considered statistically significant.

3. Results

The participants' sociodemographic and occupational characteristics are presented in Table 1. The mean age of the participants was 25.09 years (SD ± 3.25), and they had an average of 12.74 years of education (SD ± 3.15). Just over half of the participants were single (52.22%), whereas 47.78% were married. Most participants were employed in retail/sales (32.51%), hospitality (21.18%), or customer service roles (16.75%). Executive/managerial roles were the least common (7.39%), and only 4.43% of participants were classified under "Other" occupations. The average monthly household income was PKR 55,004.93 (SD ± 12,680.58). The majority resided in urban areas (71.92%) rather than rural areas (28.08%). Over half (54.19%) reported working six days per week, whereas the remainder worked five days. The daily standing duration varied, with 36.95% standing for 5–6 hours and 28.57% standing for more than 6 hours. Only 13.79% of the participants

stood for less than 2 hours daily. Most participants (85.22%) were required to wear specific footwear at work. Among these (n = 173), 71.68% wore high-heeled shoes, 17.92% wore safe shoes/boots, and 10.40% wore other types.

Table 1. Sociodemographic and occupational characteristics of the participants.

Variables		Frequency (%)
Age (in years) (Mean ± SD)		25.09 ± 3.25
Education (in years) (Mean ± SD)		12.74 ± 3.15
Marital status		106 (52.22)
		97 (47.78)
Occupation	Retail/sales associate – fashion outlet	66 (32.51)
	Customer service officer	34 (16.75)
	Hospitality staff	43 (21.18)
	Fashion industry professional	18 (8.87)
	Office/administrative staff	18 (8.87)
	Executive/managerial	15 (7.39)
	Other	9 (4.43)
Monthly household income (in PKR) (Mean ± SD)		55004.93 ± 12680.58
Locality of patients	Urban	146 (71.92)
	Rural	57 (28.08)
Number of working days per week	5 days	93 (45.81)
	6 days	110 (54.19)
Standing duration at work (per day)	Less than 2 hours	28 (13.79)
	2 – 4 hours	42 (20.69)
	5 – 6 hours	75 (36.95)
	More than 6 hours	58 (28.57)
Footwear requirement at workplace	Yes	173 (85.22)
	No	30 (14.78)
Type of job-required footwear (n = 173)	High-heeled shoes	124 (71.68)
	Safety shoes/boots	31 (17.92)
	Other	18 (10.40)

Table 2 shows the footwear preferences and usage patterns of the study participants. A majority of the participants (69.95%) preferred heeled footwear, whereas 30.05% preferred flatwear. Only one-third (33.50%) reported wearing high heels regularly, whereas 48.77% wore them occasionally and 17.73% did not wear them at all. High heels were commonly worn on special occasions by 84.24% of the participants. The most frequent activities performed on high heels included standing (44.33%) and walking (42.86%). The duration of high heel use varied, with 32.02% wearing them for 5–6 hours and 30.54% for 6 hours or more. Wedge heels (27.59%), block heels (25.62%), and stilettos (33.00%) were the most commonly worn types. In terms of heel height, 5 cm heels were most common (37.44%), followed by 7 cm heels (32.02%) and 10 cm or greater heels (16.26%). Most participants (67.49%) reported feeling confident in high heels. While 80.79% were aware of the harmful effects of high heel use, over half (56.65%) continued to wear them despite this awareness. Additionally, 68.97% reported avoiding long-distance walking when wearing high heels.

Table 2. Footwear preferences and usage patterns among participants.

Variables		Frequency (%)
Type of preferred footwear	Heeled footwear	142 (69.95)
	Flat footwear	61 (30.05)
Preference for wearing high heels regularly	Yes	68 (33.50)
	No	36 (17.73)

Variables		Frequency (%)
	No, occasionally	99 (48.77)
Preference for wearing high heels on special occasions		171 (84.24)
Most frequently performed activity while wearing high heels	Standing	90 (44.33)
	Walking	87 (42.86)
	Sitting	26 (12.81)
Duration of high heel use	Less than 3 hours	27 (13.30)
	3 – 4 hours	49 (24.14)
	5 – 6 hours	65 (32.02)
	6 hours or more	62 (30.54)
Type of high heels worn	Wedge heel	56 (27.59)
	Block heel	52 (25.62)
	Stiletto heel	67 (33.00)
	Platform sole heel	28 (13.79)
Heel height category	3 cm	29 (14.29)
	5 cm	76 (37.44)
	7 cm	65 (32.02)
	10 cm or more	33 (16.26)
Confidence associated with high heel use		137 (67.49)
Awareness of harmful effects of high heel use		164 (80.79)
Continued high heel use despite awareness of harm	Yes	115 (56.65)
	No	29 (14.29)
	Sometimes	59 (29.06)
Avoidance of long-distance walking in high heels		140 (68.97)

The pain symptoms and ankle sprain history of the participants are summarized in Table 3. Over 70% (71.43%) of the participants reported experiencing pain while wearing high heels. Among them, 33.99% rated the pain as moderate, 24.63% as mild, and 12.81% as severe, whereas 28.57% reported no pain. Pain was most frequently aggravated by walking on hard surfaces (20.00%), standing for long periods (18.62%), and walking on uneven surfaces (17.24%). Morning foot pain or pain when the participants got out of bed was reported occasionally by 53.69% and daily by 12.32% of the participants. Pain impacted daily activities in 71.43% of the patients—most commonly causing mild limitations (41.38%). Perceived imbalance while wearing high heels was reported by 56.16% of the participants. Ankle sprains affected 85.22% of the participants, with eversion injuries (53.18%) being slightly more common than inversion injuries (46.82%). Reported causes included walking on uneven surfaces (22.54%) and slipping in heels (20.81%). A history of recurrent ankle sprains was noted by 26.11% of the participants. While 9.36% experienced frequent sprains while working on high heels, 59.11% reported rare sprains, and 14.78% had never experienced sprains. Most ankle injuries (87.28%) healed within 4 weeks, although 10.98% required more than a month. Sprains occurred in the past year in 36.95% of cases, with an equal proportion seeking medical treatment. Ankle sprains led to productivity loss in 75.86% of the participants—most commonly, 1–5 days (40.89%), followed by more than 10 days (19.21%) and 6–10 days (15.76%).

Table 3. Pain, symptoms, and ankle sprain history among participants.

Variables		Frequency (%)
Presence of pain during high heel use		145 (71.43)
Intensity of pain during high heel use	Mild	50 (24.63)
	Moderate	69 (33.99)
	Severe	26 (12.81)
	No pain	58 (28.57)
Activities that worsen pain during high heel use (n = 145)	Standing for long periods	27 (18.62)
	Walking on hard surfaces	29 (20.00)

Variables		Frequency (%)
	Walking on uneven surfaces	25 (17.24)
	Walking briskly or in a hurry	16 (11.03)
	Lifting or carrying items while walking	9 (6.21)
	Wearing high heels for extended hours	11 (7.59)
	Transitioning from sitting to standing	18 (12.41)
	Involvement in workplace duties	3 (2.07)
	Other	7 (4.83)
Morning foot pain or pain when getting out of bed	Never	69 (33.99)
	Occasionally	109 (53.69)
	Everyday	25 (12.32)
Impact of pain on daily activities (ADLs)	Activities are not affected	58 (28.57)
	Activities are mildly limited	84 (41.38)
	Activities are moderately affected	38 (18.72)
	Activities are severely limited	23 (11.33)
Perceived imbalance while wearing high heels		114 (56.16)
History of ankle sprain		173 (85.22)
Type of ankle sprain experienced (n = 173)	Eversion	92 (53.18)
	Inversion	81 (46.82)
Reported cause of ankle sprain (n = 173)	Walking on uneven surfaces	39 (22.54)
	Slipping while wearing high heels	36 (20.81)
	Prolonged standing in high heels	29 (16.76)
	Sudden turning/twisting motion during work	29 (16.76)
	Running or brisk walking in heels	12 (6.94)
	Using stairs/escalators while wearing high heels	13 (7.51)
	Workplace hazard (e.g., wet floor, narrow space)	8 (4.52)
	Other	7 (4.05)
History of recurrent ankle sprains		53 (26.11)
Frequency of ankle sprains during high heel use at work	Frequently	19 (9.36)
	Occasionally	34 (16.75)
	Rarely	120 (59.11)
	Never	30 (14.78)
Ankle sprain healing time (n = 173)	Less than a week	3 (1.73)
	1-2 weeks	79 (45.66)
	2-4 weeks	72 (41.62)
	More than 4 weeks	19 (10.98)
Occurrence of ankle sprains in the past year		75 (36.95)
Sought medical treatment for high heel–related sprain		75 (36.95)
Productivity lost in the past year due to ankle sprains	No impact on productivity	49 (24.14)
	1 – 5 days	83 (40.89)
	6 – 10 days	32 (15.76)
	More than 10 days	39 (19.21)

Table 4 shows a statistically significant association between a history of ankle sprain and multiple heel-related and occupational factors. The participants with ankle sprains were more likely to wear heels ≥ 10 cm (17.92%) and for longer durations—34.10% wore them for 6 hours or more daily—than 10.00% of those without sprains ($p = 0.019$ and $p = 0.001$, respectively). Stilelet use was greater among those with sprains (35.84%) than among those without sprains (16.67%), whereas block heels were more common among those without sprains (46.67% vs. 21.97%; $p = 0.020$). Workplace footwear requirements were also significantly related, with 89.60% of those with sprains required to wear specific shoes compared with 60.00% without sprains ($p < 0.001$). Pain during high heel use was strongly associated—77.46% of sprain cases reported pain versus only 36.67% of nonsprain

cases ($p < 0.001$). Productivity loss due to ankle sprains also differed sharply; 89.02% of participants with a history of sprain reported productivity loss, whereas none of those in the no-sprain group reported any loss ($p < 0.001$).

Table 4. Associations between heel-related and occupational factors and ankle sprain history among participants.

Variable		History of Ankle Sprain		χ^2 Value	*p* Value
		Yes (n = 173)	No (n = 30)		
Heel height category	3 cm	20 (11.56)	9 (30.00)	9.991	0.019 **
	5 cm	63 (36.42)	13 (43.33)		
	7 cm	59 (34.10)	6 (20.00)		
	≥ 10 cm	31 (17.92)	2 (6.67)		
Duration of high heel use	Less than 3 hours	22 (12.72)	5 (16.67)	15.747	0.001 **
	3 - 4 hours	34 (19.65)	15 (50.00)		
	5 - 6 hours	58 (33.53)	7 (23.33)		
	6 hours or more	59 (34.10)	3 (10.00)		
Type of high heels worn	Wedge	50 (28.90)	6 (20.00)	9.882	0.020 **
	Block	38 (21.97)	14 (46.67)		
	Stiletto	62 (35.84)	5 (16.67)		
	Platform	23 (13.29)	5 (16.67)		
Footwear requirement at workplace	No	18 (10.40)	12 (40.00)	17.780	< 0.001 **
	Yes	155 (89.60)	18 (60.00)		
Presence of pain during high heel use	No	39 (22.54)	19 (63.33)	20.844	< 0.001 **
	Yes	134 (77.46)	11 (36.67)		
Productivity lost in the past year due to ankle sprains	No impact	19 (10.98)	30 (100.00)	110.636	< 0.001 **
	1–5 days	83 (47.98)	0 (0.00)		
	6–10 days	32 (18.50)	0 (0.00)		
	More than 10 days	39 (22.54)	0 (0.00)		

* Chi-square test applied; ** $p < 0.05$ considered statistically significant.

Table 5 summarizes the results of a binary logistic regression assessing predictors of ankle sprain. Increasing age was associated with significantly lower odds of ankle sprain (OR = 0.789, 95% CI: 0.676–0.921, $p = 0.003$), indicating that younger individuals had greater odds of experiencing ankle sprain. Compared with unmarried individuals, married participants had significantly lower odds of having sprained ankles (OR = 0.304, 95% CI: 0.105–0.881, $p = 0.028$). In contrast, participants who reported a workplace requirement to wear specific footwear were more than 3.5 times more likely to have a history of ankle sprain (OR = 3.534, 95% CI: 1.095–11.402; $p = 0.035$). Furthermore, the presence of pain during high heel use emerged as the strongest predictor, with nearly tenfold increased odds of ankle sprain (OR = 9.893, 95% CI: 3.445–28.408, $p < 0.001$). Similarly, participants who stood for more than 4 hours per day at work had significantly greater odds of having an ankle sprain (OR = 3.803, 95% CI: 1.336–10.821; $p = 0.012$). The model explained between 25.9% (Cox & Snell R^2) and 45.7% (Nagelkerke R^2) of the variance in ankle sprain history. Model fit was adequate, as indicated by the Hosmer–Lemeshow test ($p = 0.550$), which is greater than the conventional threshold of 0.05, suggesting no evidence of poor fit. The overall regression was statistically significant ($\chi^2(5) = 60.875$, $p < 0.001$), suggesting a reliable set of predictors for ankle sprain.

Table 5. Binary logistic regression for predictors of ankle sprain.

Variables	B	S.E.	Sig.	Exp (B)	95% CI for EXP (B)	
					Lower	Upper
Age (in years)	-0.236	0.079	0.003	0.789	0.676	0.921
Marital status (married)	-1.192	0.544	0.028	0.304	0.105	0.881
Footwear requirement at workplace (yes)	1.262	0.598	0.035	3.534	1.095	11.402

Variables	B	S.E.	Sig.	Exp (B)	95% CI for EXP (B)	
					Lower	Upper
Presence of pain during high heel use (yes)	2.292	0.538	< 0.001	9.893	3.445	28.408
Standing duration at work per day (> 4 hours)	1.336	0.534	0.012	3.803	1.336	10.821

[*] Exp(B) = odds ratio. [**] CI = confidence interval. [***] Variables with $p < 0.05$ were considered statistically significant. [****] The overall model was statistically significant, $\chi^2(5) = 60.875$, $p < 0.001$. It explained 25.9% (Cox & Snell R^2) to 45.7% (Nagelkerke R^2) of the variance in ankle sprain history classification, with a -2 log likelihood of 109.176. The Hosmer and Lemeshow test indicated good model fit ($\chi^2(8) = 6.873$, $p = 0.550$).

4. Discussion

This study explored the associations of heel-related and occupational factors with self-reported history of ankle sprains among women in various workplace settings. This study revealed a high burden of ankle injuries among participants, particularly those who wore high-heeled footwear for extended durations, used stilettos, or worked in occupations requiring specific footwear. Younger age, pain during heel use, prolonged standing, and workplace footwear are significant predictors of ankle sprain. Despite substantial awareness of potential harm, many participants continued to wear high heels regularly, reporting symptoms such as pain, imbalance, and impaired daily function.

The pattern of ankle injuries identified aligns with prior research in countries such as the United Arab Emirates, Paraguay, and India, where studies have documented significant foot and ankle strain due to high-heeled footwear in occupational environments [22,23,24]. This evidence confirms that workplace conditions, combined with footwear-related choices, play a central role in musculoskeletal vulnerability. Studies have highlighted the biomechanical instability caused by heels ≥7 cm and prolonged standing, especially in the sales and hospitality sectors [25,26]. In our study, participants wearing heels for 6 hours or more and those experiencing pain during use were more likely to have ankle sprains, which is consistent with findings that instability, reduced proprioception, and accidental slips are major contributing mechanisms to high-heel injuries. This suggests a predictable risk pattern influenced by heel height and wear time, strengthening the causal argument for injury prevention strategies [27,28,29].

Workplace-specific shoe requirements emerged as a strong predictor of ankle sprain in our regression model. These findings support international findings from a study that emphasized the negative impact of enforced dress codes and footwear protocols on musculoskeletal health, especially among female employees [30,31]. The association between footwear mandates and ankle sprains in our study also aligns with the productivity loss outcomes reported by another study. In our sample, those with ankle sprains experienced noticeable work disruption, highlighting the occupational and economic implications of preventable injuries [32,33]. This intersection of policy, ergonomics, and health highlights the urgent need to integrate safety principles into uniform and footwear guidelines in high-demand sectors [34,35].

The strongest individual predictor of ankle sprain was pain experienced during heel use. These findings reinforce findings from studies demonstrating that pain is not only a symptom but also a warning signal of compromised mechanical alignment and reduced balance control [36,37]. Perceived imbalance, reported by more than half of the participants, further supports these biomechanical risks. Despite these symptoms, continued high-heel use is often tied to psychosocial factors such as self-confidence, fashion conformity, and perceived professionalism, particularly in formal or customer-facing roles [38]. These deeply embedded cultural and occupational expectations were consistently reported across multiple contexts, highlighting a need for behavioral interventions and awareness campaigns. Without addressing the societal pressures behind footwear choices, preventive efforts may have limited impact.

This study contributes novel insights by focusing on women in diverse occupational sectors and by employing multivariate analysis to identify predictors of ankle injury risk. However, it is limited by its exploratory design, which prevents causal inference, and by its reliance on self-reported data, which may be prone to recall bias. The absence of clinical validation or biomechanical assessment limits the objective confirmation of injuries. Nonetheless, its strength lies in addressing a relatively underexplored public health concern and identifying key modifiable factors. Future research should adopt longitudinal designs, incorporate clinical diagnostics, and examine policy interventions aimed at footwear ergonomics and occupational safety.

5. Conclusions

Our study revealed that occupational factors and footwear-related behaviors significantly increase the risk of ankle sprains among working women. High heel height, prolonged daily wear, long standing hours, and mandatory footwear requirements were key contributors. Pain during high heel use emerged as the strongest predictor, suggesting that early discomfort may serve as a warning sign. These findings emphasize the need for workplace policies and awareness strategies that encourage safer footwear choices without compromising professional standards.

Author contributions: Conceptualization, SB, AH, MOR, and IT; methodology, SB, AH, MOR, IT, MA, and RA; software, SB, AH, and IT; validation, SB, AH, and IT; formal analysis, SB, AH, and IT; investigation, SB, AH, and IT; resources, SB, AH, MOR, and IT; data curation, SB, AH, and IT; writing—original draft preparation, SB, AH, MOR, IT, MA, and RA; writing—review and editing, SB, AH, MOR, and IT; visualization, SB, AH, MOR, and IT; supervision, MOR; project administration, SB, AH, and IT. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no specific grant from the public, commercial, or not-for-profit funding agencies.

Ethics statement: The study obtained ethical approval from the Ethics Review Committee (ERC) of Hussain College of Health Sciences, Lahore, Pakistan (Ref. No. HCHS/2023/ERC/31).

Consent to participate: Not applicable.

Data availability: The data supporting this study's findings are available from the corresponding author, Sana Babar, upon reasonable request.

Acknowledgments: None.

Conflicts of interest: The authors declare no conflicts of interest.

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