# PREVALENCE OF MUSCULOSKELETAL COMPLAINTS IN THE SPINE AND LOWER EXTREMITIES OF ADULT FEMALE USERS OF HIGH-HEELED SHOES IN CALABAR, CROSS RIVER STATE

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**Abstract**
*This study assessed the prevalence of musculoskeletal complaints in the spine and lower extremities of adult female users of high-heeled shoes in Calabar, Cross River State. A cross-sectional study was conducted on 100 adult female users of high-heeled shoes from the University of Calabar and banks in Calabar. Participants' age and heel heights were obtained and categorized. Musculoskeletal complaints were assessed by a validated questionnaire on musculoskeletal complaint by a previous study. Descriptive statistics of frequency and percentage were use to summarized the data. The findings of the study revealed that majority of the respondents were aged 25-29 years, 52% were students while 48% were bankers. The 3-inches high-heeled shoes were the most 45(45%) worn high heels, followed by 2-inches high-heeled shoes 40(40%). The study also shows that majority, 26(54.17%), of the 3-inches high-heeled shoes were worn by bankers; whereas majority, 31(59.61%), of the 2-inches high-heeled shoes were worn by students. Complaints in the lower back was most prevalent (38.00%), followed by: the cervical spine (30.00%), feet (26.00%), knees (24.00%). thoracic spine (21%), hips (17%) and the lower leg (15%). Musculoskeletal complaints in the lower back, cervical spine, knees, and feet are prevalent among adult female users of high-heeled shoes in Calabar.*

**Key words**: Musculoskeletal complaints, High-heeled shoes, Spine, Lower extremities, Adult females

## Introduction

Musculoskeletal complaints (MSCs) encompass a wide range of disorders affecting muscles, bones, joints, and associated tissues, often leading to pain, disability, and reduced quality of life (Lu et al., 2025; Okafor et al., 2024). Globally, MSCs are among the leading causes of disability, affecting approximately 1.71 billion people worldwide (Safiri et al., 2020). The most commonly reported musculoskeletal

conditions include low back pain, osteoarthritis, and neck pain, which contribute significantly to years lived with disability (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, 2018). In Africa, the burden of MSCs is increasing due to aging populations, urbanization, and lifestyle changes, but epidemiological data remain limited (Aboderin & Nanyonjo, 2017). Studies from various African countries suggest a high prevalence of musculoskeletal pain, with notable impacts on daily functioning and productivity (Ho-A-Tham et al., 2023; Okafor et al., 2024). Within Nigeria, research indicates that MSCs are a significant public health concern, particularly among adults, with reported prevalence rates ranging from 20% to 61.4% in some population groups (Emorinken et al., 2023; Olufemi et al., 2022). Factors such as occupational strain, ergonomic challenges, and lifestyle behaviours, including the frequent use of high-heeled shoes among women, are thought to contribute to this burden (Ubom et al., 2024).

High-heeled shoes have long been a staple of women's fashion, symbolizing elegance, confidence, and status. In many urban centres—including Calabar, Cross River State—women across age groups routinely wear high heels for social, professional, and cultural purposes. Despite their widespread popularity, a growing body of evidence highlights the adverse health implications of regular high-heeled shoe use, particularly musculoskeletal discomfort and dysfunction (Malick et al., 2020; Odebiyi et al., 2015; Younas et al., 2023).

The biomechanics of walking and posture are significantly altered by elevated heels, with increased lumbar lordosis, anterior pelvic tilt, and imbalanced lower limb loading being among the most documented effects (El-Shafei et al., 2021). These changes can lead to chronic conditions affecting the spine, knees, hips, and feet. Studies have also shown a higher prevalence of knee flexion and varus moments during gait among high-heel users, which may predispose women to osteoarthritis and long-term joint instability (Nguyen et al., 2021). Furthermore, High-heeled shoes can harm the spine, hips, knees, ankles, and feet, as well as significantly affect posture and stride (Dsouza, Menezes,& Dsouza, 2024).

In Nigeria, the public health implications of fashion-driven choices like high-heel usage remain under-researched. Odebiyi et al. (2015) reported that professional bankers who wear high heels regularly report increased discomfort in the lower back, knees, and ankles. However, there is a dearth of data quantifying the prevalence and patterns of these symptoms among adult female users of high-heeled shoes in Calabar, Nigeria. Moreover, cultural and lifestyle factors may influence the intensity and type of footwear-related health outcomes in this context (Malick et al., 2020). Despite the widespread use of high-heeled shoes among women globally, there is limited data on how occupational, and lifestyle factors specific to Calabar influence the prevalence and nature of MSCs associated with high-heel use. This lack of localized evidence creates a significant gap in understanding the extent and characteristics of such complaints in this population. Therefore, this study aims to fill this gap by assessing the prevalence of MSCs in the spine and lower extremities of adult female high-heel users in Calabar, Cross River State.

**Research question**

What is the prevalence of MSCs in the spine and lower extremities of adult female high-heel users in Calabar, Cross River State?

**Methodology**

A cross-sectional descriptive survey was conducted to examine musculoskeletal complaints among adult females who regularly wear high-heeled footwear in Calabar Metropolis. The target population included adult female students and bankers aged 18 years and above residing in Calabar who reported wearing high-heeled shoes (≥2 inches) at least three times a week for a minimum of one year duration. Participants were excluded if they had any disability that or foot pain that prevented the use of high-heeled shoes, or have pregnancy, or other medical conditions that prevent the use of high-heeled shoes.

Purposive sampling was used to identify the female halls of residence of the University of Calabar and banks in Calabar from which consenting participants were consecutively recruited. Prior to the commencement of the study, ethical approval was sought and obtained from the Health Research and Ethics Committee of the University of Calabar. Permission was also obtained from heads of halls of residence and the bank managers.

The Musculoskeletal Complaints Questionnaire (MCQ) was adapted to assess participants' MSCs. The MCQ consists of a series of questions designed to inquire about the presence, frequency, and severity of musculoskeletal symptoms experienced by individuals over a specified period (Kreis et al., 2021). The MCQ covers a range of body regions, including the neck, shoulders, upper back, elbows, wrists/hands, lower back, hips/thighs, knees, and ankles/feet (Liebers *et al.*,2024). For this study, participants completed the sections on the neck, upper back (thoracic), lower back, hips/thighs, knees, and ankles/feet.

The MCQ is easy to administer and can be completed in a relatively short amount of time (Liebers *et al.*,2022). Its reliability and validity have been established to assess and address musculoskeletal complaints among undergraduate students (Liebers *et al.*,2022). The questionnaires were distributed to all participants and collected on next visit by the researcher. Participants' age were obtained and categorize into 18-24 years, 25-29 years and 30 years and more. Participants' heel heights were also measured and categorized into 2, 3, 4, and 5 inches, respectively. Data were entered and analysed using SPSS version 25. Descriptive statistics of frequencies and percentages were used to summarize the data.

**Data analysis and findings**

**Table 1.0: Sociodemographic parameters of participants**

| No | Items | Frequency | Percentage |
|---|---|---|---|
| **1.** | **Age Categories** | | |
| | 18-24 | 25 | 25.0 |
| | 25-29 | 62 | 62.0 |
| | 30 and above | 13 | 13 |
| | Total | 100 | 100.0 |
| **2.** | **Occupation** | | |
| | Students | 52 | 52.0 |
| | Bankers | 48 | 48.0 |
| | Total | 100 | 100.0 |
| **3.** | **Participants Heel Heights** | | |
| | 2-inches | 40 | 40.0 |
| | 3-inches | 45 | 45.0 |
| | 4-inches | 11 | 11.0 |
| | 5-inches | 4 | 4.0 |
| | Total | 100 | 100.0 |
| **4.** | **Students Heel Heights** | | |
| | 2-inches | 31 | 59.6 |
| | 3-inches | 19 | 36.6 |
| | 4-inches | 2 | 3.8 |
| | 5-inches | - | 0 |
| | Total | 52 | 100.0 |
| 5. | **Bankers Heel Heights** | | |
| | 2-inches | 9 | 18.8 |
| | 3-inches | 26 | 54.2 |
| | 4-inches | 9 | 18.8 |
| | 5-inches | 4 | 8.3 |
| | Total | 48 | 100 |

A total of 100 questionnaires were duly completed by the participants. Majority of the respondents were aged 25-29 years old, 52% were students while 48% were bankers (Table 1.0). The 3-inches high-heeled shoes were the most 45 (45%) worn high heels by all respondents, followed by the 2-inches high-heeled shoes 40 (40%) (Table 1.0). Majority, 26 (54.17%), of the 3-inches high-heeled shoes were worn by bankers; whereas majority, 31(59.61%), of the 2-inches high-heeled shoes were worn by students (Table 1.0). Only 4 bankers out of all participants wore 5-inches high-heeled shoes and almost all 4-inches high-heeled shoes (Table 1.0).

**Research question** - What is the prevalence of MSCs in the spine and lower extremities of adult female high-heel users in Calabar, Cross River State.

**TABLE 1.1: Prevalence of musculoskeletal complaints in the spine and lower extremity of respondents**

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| Neck & Cervical Spine | | |
| **Complaints in the neck in 12 months** | | |
| No | 53.00 | 53.00 |
| Yes, For 1-7 days | 30.00 | 30.00 |
| Yes, For 8-30 days | 7.00 | 7.00 |
| Yes, for more than 30 days, but not every day | 3.00 | 3.00 |
| Yes, (almost) every day | 0.00 | 0.00 |
| Thoracic Spine | | |
| **Complaints in thoracic spine in 12 months** | | |
| No | 71.00 | 71.00 |
| Yes, For 8-30 days | 21.00 | 21.00 |
| Yes, For 1-7 days | 4.00 | 4.00 |
| Yes, for more than 30 days, but not every day | 4.00 | 4.00 |
| Yes, (almost) every day | 0.00 | 0.00 |
| Lumbar Spine | | |
| **Complaints in lower back in 12 months** | | |
| No | 44.00 | 44.00 |
| Yes, For 1-7 days | 38.00 | 38.00 |
| Yes, For 8-30 days | 13.00 | 13.00 |
| Yes, for more than 30 days, but not every day | 3.00 | 3.00 |
| Yes, (almost) every day | 0.00 | 0.00 |
| Hip Joint and Thigh | | |
| **Complaints in hip joints in 12 months** | | |
| No | 81.00 | 81.00 |
| Yes, For 1-7 days | 17.00 | 17.00 |
| Yes, For 8-30 days | 2.00 | 2.00 |
| Yes, for more than 30 days, but not every day | 0.00 | 0.00 |
| Yes, (almost) every day | 0.00 | 0.00 |
| Knee Joints | | |
| **Complaints in knee joints in 12 months** | | |
| No | 64.00 | 64.00 |
| Yes, For 1-7 days | 24.00 | 24.00 |
| Yes, For 8-30 days | 7.00 | 7.00 |
| Yes, for more than 30 days, but not every day | 1.00 | 1.00 |
| Yes, (almost) every day | 4.00 | 4.00 |
| Lower leg | | |
| **Complaints in knee joints in 12 months** | | |
| No | 81.00 | 81.00 |
| Yes, For 1-7 days | 15.00 | 15.00 |
| Yes, For 8-30 days | 2.00 | 2.00 |
| Yes, for more than 30 days, but not every day | 2.00 | 2.00 |
| Yes, (almost) every day | 0.00 | 0.00 |
| Ankles and feet | | |
| **Complaints in ankles & feet in 12 months** | | |
| No | 68.00 | 68.00 |

| | | |
|---|---|---|
| Yes, For 1-7 days | 26.00 | 26.00 |
| Yes, For 8-30 days | 2.00 | 2.00 |
| Yes, for more than 30 days, but not every day | 1.00 | 1.00 |
| Yes, (almost) every day | 3.00 | 3.00 |

Complaints in the lower back was the most experienced musculoskeletal complaints within 1 to 7 days in the last 12 months by more than a third (38.00%) of the participants (Table 1.1). This was followed by complaints in the cervical spine by about a third (30.00%) of the participants, complaint by about a quarter of the participants in the feet (26.00%) and knees (24.00%). 21% of the participants reported complaint in the thoracic spine, 17% in the hips and 15% in the lower leg(Table 1.1). At least 10% of the participants reported that the pain in the lower back persisted for 8 to 30 days (Table 1.1).

**Discussion of Findings**

This study investigated the prevalence of musculoskeletal complaint among adult female who wear high heels in Calabar, Nigeria. The participants were young adults with majority aged 25-29 years, and 52% being students and 48% working as bankers. This age range is crucial, as it represents a transitional period in adulthood where many individuals establish their professional identities while also being influenced by cultural and societal pressures. High heel use is reported to be commonly worn among young adult women, particularly in corporate settings and social contexts where image and fashion play a significant role (Lorkowski & Pokorski, 2023; Wade et al., 2022). The findings of this study of age range of mid-20s align with Broega et al. (2017) who reported that 85% of their study participants were young adults.

A notable distinction between the two major occupational groups in this study was found in their preference for heel height. Bankers predominantly wore 3-inch heels which explain that they were more likely to adhere to the formal dress codes typically found in corporate banking settings. High heels, especially those around 3-inches and higher were reported to be worn by workers in banks in Lagos Nigeria (Odebiyi et al., 2015), and may be considered a part of professional attire in banks given the assertion of Sotak et al. (2023) that professional attire are considered in office environments that emphasize neatness, formality, and the maintenance of a professional image. Conversely, students, whose daily routines typically involve more movement and less formal dress, are more likely to prioritize comfort and practicality in their footwear choices, leading to a preference for lower heels. The preference for lower heels likely reflects a balance between comfort and style, as students engage in more walking and standing throughout their day compared to workers in office settings. This finding is in line with Broega et al. (2017), who reported that younger women in less formal settings tend to opt for lower heel heights to accommodate the demands of walking and prolonged standing during activities.

Additionally, the limited number of participants who wore 4-inch or 5-inch heels (only four bankers) suggests that while high heels are common, extreme heel heights are less frequent. This finding aligns with research by Odebiyi et al. (2015), who reported that while majority of female bankers wear high heels of 3 and 4 inches, the use of very high heels (5 inches and above) is relatively less among female bankers,

probably due to comfort concerns and the physical strain associated with wearing such heights for prolonged periods.

The results of this study reveal a significant prevalence of musculoskeletal complaints in the spine and lower extremities among adult female users of high-heeled shoes in Calabar. Among the participants, lower back pain was the most commonly reported musculoskeletal complaint, with 38% of the women experiencing discomfort within the past 1 to 7 days. This finding is consistent with a wide body of research that has identified lower back pain as a frequent consequence of high-heel usage (Firmanurulita et al., 2023;Nadeem, 2019; Odebiyi et al., 2015). High heels alter the posture and biomechanics of the body, shifting the of gravity forward and causing an increase in lumbar lordosis (the inward curvature of the lower back). This compensatory mechanism places additional strain on the lower spine, leading to discomfort and pain. Studies by Afzal and Manzoor (2017) and Russell (2010) similarly highlight how prolonged high heel usage is linked to persistent lower back pain due to these biomechanical changes. Following lower back pain, complaints in the cervical spine were also prevalent, affecting about 30% of participants. This finding is notable; as it suggests that high-heeled shoe usage does not only impact the lower back but can also cause pain in the neck and upper spine. Previous studies have reported increase in the cervical musculature of individuals with neck pain that uses high-heeled shoes (Han, 2015; Park et al., 2016). This may be due to the principle of segmental interaction with the use of high-heeled shoes producing a segmental interaction effect from the lower extremity to the spine. Abnormal inter-segmental coordination has been considered a risk factor for developing back pain (Lin et al., 2020). The segmental interaction principle between the spine and lower extremity is hinged on the relationship among the spinal joint motions observed as a whole on the basis of each relative motion with the lumbosacral joint connecting the spine and pelvis.

Complaints in the feet (26%) and knees (24%) were also reported by a significant proportion of participants, which highlights the impact of high-heeled shoes on the lower extremities. High heels place excessive pressure on the forefoot, which can lead to pain, particularly in the toes and metatarsals. This can also affect the knee joint by altering its natural alignment and increasing the load on the patellofemoral joint. Studies have consistently shown that high heels are associated with foot pain, knee pain, and overall discomfort in the lower extremities due to altered walking mechanics and joint stress (Cronin, 2014; Hasiuk et al., 2023; Zeng et al., 2023).

Additionally, this study found that the thoracic spine (21%), hips (17%), and lower legs (15%) were also areas where participants reported pain. These findings further support the idea that the musculoskeletal impact of high heels is widespread, affecting multiple regions of the body, especially those involved in maintaining balance and posture. The thoracic spine and hips are crucial for maintaining an upright posture while wearing high heels and the compensatory postural changes can lead to strain in these areas as well. This underscores the holistic impact of high-heeled shoe usage on the musculoskeletal system. Another important finding in this study was that 10% of participants reported lower back pain that persisted for 8 to 30

days, suggesting that some individuals experience persistent pain rather than transient discomfort. Chronic pain from high-heeled shoe usage has been well-documented in literature (Almadhaani et al., 2024), as prolonged stress on the musculoskeletal system can lead to long-term issues if not addressed. This finding highlights the potential long-term consequences of habitual high heel use and the need for effective interventions to mitigate these effects.

Overall, this study highlights some public health implications on the prevalence of musculoskeletal complaints in the spine and lower extremity of high-heeled shoe users, and hence calls for increased awareness and preventive measures. Public health initiatives should focus on educating women about the risks of high heel usage and promoting the use of ergonomically designed footwear or offering alternative footwear options for daily use. Moreover, workplaces can play a role in promoting healthier footwear choices or implementing policies that allow for more flexibility in footwear, especially for women who spend long hours standing or walking.

While the study provides valuable insights into the prevalence of musculoskeletal complaints among high heel users, there are some limitations to consider. One limitation is the self-reported nature of the data, which could introduce biases in terms of participants' over- or under-reporting the severity of their symptoms. Additionally, the cross-sectional design of the study means that it captures data at a single point in time, which may not fully capture the long-term effects of high heel use. Longitudinal studies would be beneficial to explore the chronicity of musculoskeletal complaints and how they evolve over time with continued high heel usage.

**Conclusion**

This study highlights that musculoskeletal complaints in the lower back, cervical spine, knees, and feet are prevalent among adult female users of high-heeled shoes in Calabar, Cross River State. These findings are consistent with existing literature on the adverse effects of high-heeled footwear on musculoskeletal health.

**Recommendations**

The following recommendations are proposed based on the findings of this study:

1. There is need for targeted public health campaigns to raise awareness among women, especially young adults and professional women in Calabar, about the potential musculoskeletal risks associated with prolonged high-heel use.
2. Educational programmes should highlight the biomechanical impacts of high heels and encourage moderation in heel height and duration of use.
3. Employers, particularly in formal office environments like banks, should consider revising dress codes to allow more flexibility in footwear choices.
4. Policies that permit or encourage lower heel heights or alternative comfortable shoes may help reduce the burden of musculoskeletal pain among female employees who stand or walk for extended periods.

5. To better understand the long-term effects of high-heel usage and musculoskeletal health, future research should employ longitudinal study designs.
6. Additionally, exploring the effectiveness of preventive interventions and ergonomic footwear in reducing musculoskeletal complaints would provide valuable evidence to guide public health strategies.

**References**

Aboderin, I., & Nanyonjo, A. (2017). Musculoskeletal health conditions among older populations in urban slums in sub-Saharan Africa. *Best practice & research. Clinical rheumatology*, *31*(2), 115–128. https://doi.org/10.1016/j.berh.2017.11.001.

Afzal, F., & Manzoor, S. (2017). Prolong wearing of high heeled shoes can cause low back pain. Journal of Novel Physiotherapies, 7, 356. Omics online.

Almadhaani, H. M. A., Goonetilleke, R. S., Wijeweera, A., Jayaraman, R., Ameersing, L., Khandoker, A. H., & Tamrin, S. B. M. (2024). Transient pain and discomfort when wearing high-heeled shoes. *Scientific reports*, *14*(1), 9291. https://doi.org/10.1038/s41598-024-59966-9.

Broega, A. C., Righett O, M., & Ribeiro, R. (2017). Female high heel shoes: a study of comfort. 17th World Textile Conference AUTEX 2017- Textiles - Shaping the Future. IOP Conf. Series: Materials Science and Engineering 254 (2017) 232001 doi:10.1088/1757-899X/254/23/232001.

Cronin N. J. (2014). The effects of high heeled shoes on female gait: a review. *Journal of electromyography and kinesiology: official journal of the International Society of Electrophysiological Kinesiology*, *24*(2), 258–263. https://doi.org/10.1016/j.jelekin.2014.01.004.

Dsouza, V., Menezes, R., & Dsouza, S. T. (2024). Impact of high-heeled footwear on the health of young female students of selected colleges of Mangalore, India. *International Journal of Occupational Safety and Health*, *14*, 45–50. https://doi.org/10.3126/ijosh.v14i1.45085.

El-Shafei, M. A., Yousef, A. M., Hamada, H. A., Mohamed, M. F., Al-Shenqiti, A. M., Koura, G. M. R., & López Sánchez, G. F. (2021). Effect of Low Versus High-Heeled Footwear on Spinopelvic Alignment at Different Phases of Menstrual Cycle in Young Adult Women: A Biopsychosocial Perspective. *Frontiers in psychology*, *12*, 792446. https://doi.org/10.3389/fpsyg.2021.792446.

Emorinken, A., Erameh, C. O., Akpasubi, B. O., Dic-Ijiewere, M. O., & Ugheoke, A. J. (2023). Epidemiology of low back pain: frequency, risk factors, and patterns in South-South Nigeria. *Reumatologia*, *61*(5), 360–367. https://doi.org/10.5114/reum/173377.

Firmanurulita, F., Kristiyanto, A., & Prasetya, H. (2023). Meta-Analysis of the Effect of Prolonged Use of High Heels on Low Back Pain in Female Sales Employees. *Journal of Epidemiology and Public Health*, *8*(4), 478–486. https://doi.org/10.26911/jepublichealth.2023.08.04.06.

GBD 2017 Disease and Injury Incidence and Prevalence Collaborators (2018). Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study

2017. *Lancet (London, England)*, *392*(10159), 1789–1858. https://doi.org/10.1016/S0140-6736(18)32279-7.

Han D. (2015). Muscle activation of paraspinal muscles in different types of high heels during standing. *Journal of physical therapy science*, *27*(1), 67–69. https://doi.org/10.1589/jpts.27.67.

Hasiuk, A., Jaszczur-Nowicki, J., Granda T., et al. (2023). Effect of wearing high heels on the biomechanical parameters of the foot. Journal of Kinesiology and Exercise Sciences, 33(103), 8-17. https://doi.org/10.5604/01.3001.0053.8076.

Ho-A-Tham, N., Ting-A-Kee, B., Struyf, N., de Almeida Mello, J., Dankaerts, W., & Vanlandewijck, Y. (2023). Prevalence of musculoskeletal complaints and health-related quality of life in a Maroon and Kalinya Indigenous rural village in Suriname. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*, *32*(7), 1955–1970. https://doi.org/10.1007/s11136-023-03363-8.

Kreis, L., Liebers, F., Dulon, M., Freitag, S., & Latza, U. (2021). Verwendung des NordischenFragebogenszuMuskel-Skelett-eschwerden. *ZentralblattfürArbeitsmedizin, Arbeitsschutz und Ergonomie*, *71*(4), 184-191.

Liebers, F., Freyer, M., Dulon, M., Friday, S., Michaelis, M., Latza, U., & Hegewald, J. (2024). New German-language questionnaire for the standardized recording of musculoskeletal complaints in the workplace. *ZblArbeitsmed* 74 , 13–25. https://doi.org/10.1007/s40664-023-00516-x.

Liebers, F., Freyer, M., Freitag, S., Dulon, M., Hegewald, J., & Latza, U. (2022). FragebogenZuMuskel-Skelett-Beschwerden Fb* Msb). *BundesanstaltFürArbeitsschutz Und Arbeitsmedizin (Baua)/BerufsgenossenschaftFürGesundheitsdienst Und Wohlfahrtspflege (Bgw)*.

Lin, H., Seerden, S., Zhang, X., Fu, W., &Vanwanseele, B. (2020). Inter-segmental coordination of the spine is altered during lifting in patients with ankylosing spondylitis: A cross-sectional study. *Medicine*, *99*(5), e18941. https://doi.org/10.1097/MD.0000000000001894.

Lorkowski, J., & Pokorski, M. (2023). Harmful female footwear: A public health perspective. *Heliyon*, *9*(11), e21297. https://doi.org/10.1016/j.heliyon.2023.e21297.

Lu, M., Zheng, G., Shen, X., Ouyang, Y., Hu, B., Chen, S., & Sun, G. (2025). Trends and future burden of other musculoskeletal diseases in China (1990-2041): a comparative analysis with G20 countries using GBD data. *BMC public health*, *25*(1), 2120. https://doi.org/10.1186/s12889-025-23285-z.

Malick, W. H., Khalid, H., Mehmood, Z., & Hussain, H. (2020). Association of musculoskeletal discomfort with the use of high heeled shoes in females. *JPMA. The Journal of the Pakistan Medical Association..*, *70*(12(A)), 2199–2204. https://doi.org/10.47391/JPMA.536.

Nadeem, I. (2019). High Heels and Low Back Pain in Young Female Students (M. Kashif, S. Mushtaq, R. Hussain, N. Naseem, H. Darain, & D. Khan , Trans.). *International Journal of Pathology*, *16*(2), 87-91. https://www.jpathology.com/index.php/OJS/article/view/365.

Nguyen, L. Y., Harris, K. D., Morelli, K. M., & Tsai, L. C. (2021). Increased knee flexion and varus moments during gait with high-heeled shoes: A systematic

review and meta-analysis. *Gait & posture*, *85*, 117–125. https://doi.org/10.1016/j.gaitpost.2021.01.017.

Odebiyi, D. O., Ajiboye, E. O., Tella, B. A., & Jaja, S. I. (2015). Musculoskeletal discomfort accompanying the regular use of high-heeled shoes among professional women. *Nigerian Quarterly Journal of Hospital Medicine, 25*(4).

Okafor, U. A. C., Akinbo, S. R., Odebiyi, D. O., Oghumu, S. N. (2024). Knowledge, attitude, and practice of patients, health care practitioners, and road-traffic safety regulators on patients' return to driving policy after recovery from musculoskeletal disorders. Journal *of the International Society of Physical and Rehabilitation Medicine,* 7(4), 121-128. https//doi.org/10.1097/ph9.0000000000000044.

Olufemi, A., Hakeem, O. B., Olalade, W. K., Sunday, O. O., & Oluwole, A. O. (2022). Epidemiology of rheumatic and musculoskeletal diseases in a Nigerian peri-urban community: results of a cross-sectional survey using the COPCORD stage 1 model. *Reumatologia*, *60*(6), 366–375. https://doi.org/10.5114/reum.2022.123667.

Park, K., Kim, Y., Chung, Y., & Hwang, S. (2016). Effects of the height of shoe heels on muscle activation of cervical and lumbar spine in healthy women. *Journal of physical therapy science*, *28*(3), 956–959. https://doi.org/10.1589/jpts.28.956.

Russell B. S. (2010). The effect of high-heeled shoes on lumbar lordosis: a narrative review and discussion of the disconnect between Internet content and peer-reviewed literature. *Journal of chiropractic medicine*, *9*(4), 166–173. https://doi.org/10.1016/j.jcm.2010.07.003.

Safiri, S., Kolahi, A. A., Smith, E., Hill, C., Bettampadi, D., Mansournia, M. A., Hoy, D., Ashrafi-Asgarabad, A., Sepidarkish, M., Almasi-Hashiani, A., Collins, G., Kaufman, J., Qorbani, M., Moradi-Lakeh, M., Woolf, A. D., Guillemin, F., March, L., & Cross, M. (2020). Global, regional and national burden of osteoarthritis 1990-2017: a systematic analysis of the Global Burden of Disease Study 2017. *Annals of the rheumatic diseases*, *79*(6), 819–828. https://doi.org/10.1136/annrheumdis-2019-216515.

Sotak, K. L., Serban, A., Friedman, B. A., &Palanski, M. (2023). Perceptions of Ethicality: The Role of Attire Style, Attire Appropriateness, and Context. *Journal of business ethics: JBE*, 1–27. Advance online publication. https://doi.org/10.1007/s10551-023-05347-7.

Ubom, I. M., Echem, R. C., & Madume, A. K. (2024). Impact of health education on footwear practices in reducing low back pain among patients in Rivers State, Nigeria. *Svāsthya: Trends in General Medicine and Public Health*, *1*(1), e5. https://doi.org/10.70347/svsthya.v1i1.5.

Wade, T. J., Burch, R., Fisher, M. L., & Casper, H. (2022). On a pedestal: High heels and the perceived attractiveness and evolutionary fitness of women. *Personality and Individual Differences, 188,* Article 111456. https://doi.org/10.1016/j.paid.2021.111456.

Younas, A. S., Tanveer, F., Sharif, F., Waseem, I., Mahmood, W., & Ahmad, A. (2023). Association of low back pain with the use of high heel in ladies: A systematic review. *Anaesthesia, Pain & Intensive Care*, *27*(6), 681–688. https://doi.org/10.35975/apic.v27i6.2339.

Zeng, Z., Liu, Y., Hu, X., Li, P., & Wang, L. (2023). Effects of high-heeled shoes on lower extremity biomechanics and balance in females: a systematic review and meta- analysis. *BMC public health*, *23*(1), 726. https://doi.org/10.1186/s12889-023-15641-8.