Original Article

Assessing Flat Foot Prevalence and Associated Risk Factors in Jazan Region: Demographic and Lifestyle Considerations

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Article info

Abstract

Objective: The primary goal of this research was to determine the prevalence of flatfoot among adult residents of the Jazan region in Saudi Arabia. Additionally, the study sought to identify significant risk factors associated with flatfoot by analyzing demographic variables, clinical conditions, and lifestyle characteristics. **Methods:** This study employed a descriptive observational approach, enrolling 317 adults aged between 18 and 60 years residing in Jazan, Saudi Arabia. A self-administered online questionnaire was used to collect data, yielding 210 valid responses suitable for analysis. The questionnaire was specifically designed to capture information related to the prevalence of flatfoot, associated symptoms, and various potential risk factors, including demographic data, clinical history, lifestyle behaviors, and footwear choices. Data analysis was conducted using Microsoft Excel, with statistical measures used to establish associations between flatfoot prevalence and the evaluated variables. **Results:** The findings revealed that the overall prevalence of flatfoot differed significantly by gender, with females displaying a higher prevalence rate (8%) compared to males (3%). Key risk factors identified included elevated body mass index (BMI), with higher prevalence observed among individuals classified as overweight or obese—specifically, 12% of females and 5% of males in these categories were affected by flatfoot. Additionally, lifestyle factors, particularly the use of unsupportive or improper footwear, were strongly linked to increased flatfoot risk. Clinical comorbidities, notably diabetes mellitus and rheumatoid arthritis, also emerged as significant risk factors associated with flatfoot in the studied population. **Conclusion:** The prevalence of flatfoot in Jazan underscores the need for targeted interventions that focus on modifiable risk factors, including weight management and proper footwear. Public health initiatives should prioritize awareness and prevention strategies to mitigate flatfoot-related complications.

Keywords: Flatfoot, Prevalence, Risk Factors, BMI, Jazan Region, Saudi Arabia.

Introduction

Flatfoot (FF), also known as pes planus, is a condition characterized by the collapse of the medial arch of the foot, leading to the entire sole coming into complete or near-complete contact

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with the ground. This condition can cause discomfort and pain, particularly while standing or walking for extended periods (Erol et al., 2015). In Saudi Arabia, the prevalence of FF varies across regions and populations. A systematic review of studies on flatfoot prevalence among the Saudi population revealed a wide range of prevalence rates influenced by factors such as age, sex, and body mass index (BMI) (Bourgleh et al., 2019). The review included studies from various regions, including the central, western, and southern parts of the country, with participants ranging in age from toddlers to adults. While specific data on the prevalence of FF among the adult population in the Jazan region are limited, it is likely that similar factors influencing flatfoot prevalence in other regions of Saudi Arabia also apply to Jazan. These factors include obesity, which has been found to be associated with a higher prevalence of flatfoot. Additionally, the condition can be congenital or acquired, with acquired flatfoot often resulting from factors such as injury, arthritis, or prolonged stress (Pourghasem et al., 2016). Efforts to address FF in the Saudi population include raising awareness about the condition, promoting early diagnosis, and providing appropriate interventions such as orthotic devices, physical therapy, and surgical correction in severe cases. Further research is needed to better understand the prevalence and impact of flatfoot in specific regions, such as Jazan, and to develop targeted strategies for prevention and management (Ezema et al., 2013). When highlighting the risk factors and prevalence rates of FF, we discovered that they fluctuated based on population type, age, and the presence of comorbidities. Factors such as family history, wearing shoes at a young age, urban living, obesity, age, sex, BMI, and foot length have all been linked to flatfeet (Ezema et al., 2013). Additionally, flatfoot may be a secondary symptom of illnesses such as ligament laxity, diabetes mellitus (DM), Charcot foot, and peroneal spastic flatfoot.[5] Associated abnormalities of FF can lead to pain, instability, abnormal plantar pressure distribution, and gait issues such as slower walking, longer strides, and prolonged standing between steps. These issues mainly affect daily activities and general well-being

(Arachchige et al., 2019).

FF is a clinically significant condition that can lead to various musculoskeletal complications due to abnormal foot mechanics, often manifesting as discomfort, pain during walking, and restricted mobility (Khan et al., 2022). In today's fast-paced world, FF has become increasingly prevalent across different populations and genders. While extensive research has examined its prevalence and contributing factors, there remains a gap in studies specifically targeting the Jazan region.

Jazan is a unique area in Saudi Arabia characterized by diverse occupational demands, environmental factors, and lifestyle habits that may contribute to the development of flatfoot. Additionally, many residents engage in physically demanding occupations, which may influence foot structure and mechanics. Therefore, investigating the prevalence and risk factors of FF in Jazan is crucial for developing targeted interventions and preventive measures.

This study hypothesized that various occupational, lifestyle, and physiological factors significantly impact the occurrence of FF in the Jazan population. By addressing this specific issue, this study adds valuable insights to the existing literature on FF, while providing region-specific data that can inform healthcare policies and interventions.

Methodology

Participants and Study Design

This study employed an observational descriptive design to assess the prevalence and risk factors for flatfoot among adults in the Jazan region. A randomly distributed online survey was used to recruit participants aged 18–60 years, with a target sample size of 317. In total, 210 valid responses were collected.

Participants were selected using a simple random sampling method. The inclusion criteria consisted of Saudi citizens residing in Jazan, aged 18 to 60

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years, of both genders. Individuals under 18 years or over 60, non-Saudi nationals, and those with unrelated health conditions that might affect the study's outcomes were excluded (Alzahrani et al., 2023).

Procedure

A self-administered online questionnaire was used to gather demographic details, pain assessments, foot structures, and lifestyle factors. The survey consisted of 28 questions, including both closed- and open-ended formats. It assesses the prevalence of flatfoot, associated symptoms, and potential risk factors such as family history, medical history, footwear habits, and physical activity levels (Witari et al., 2018). Flatfoot was identified based on the participants' self-reports of experiencing the condition and associated difficulties, including pain, discomfort, and mobility issues.

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki (1975). All participants provided informed consent before participation by signing the consent form (Alahmari et al. 2021).

Statistical Analysis

Data analysis was conducted using Microsoft Excel to organize, clean, and analyse the participant responses. Demographic and clinical data were entered into Excel sheets, and inconsistencies such as missing values were addressed to ensure accuracy. Descriptive statistics, including frequencies, percentages, and averages, were calculated to summarize participant characteristics such as age, gender, BMI, and activity levels. Comparative analysis was performed using pivot tables in Excel to evaluate flat foot prevalence and its associated factors across gender and age groups.

Results

Table 1 presents the descriptive statistics for age, height, weight, and BMI by gender. The mean age for males was 27.7 years (±12.5), while for females, it was 32.9 years (±12.1). Males had a higher average height (170.9 cm ±10.1) compared to females (157.0 cm ±6.8). Females had a slightly higher average BMI (24.4 ±6.1) than males (23.3 ±5.5).

Table 1: Gender descriptive statistics for Age, Height, Weight, and BMI:

Gender	Age Mean ± SD	Height Mean±SD	Weight Mean±SD	BMI Mean±SD
M	27.7±12.5	170.9±10.1	68.1±17.4	23.3±5.5
F	32.9±12.1	157.0±6.8	61.1±14.1	24.4±6.1

M= Male, F= Female

Table 2 shows the distribution of the professions by percentage. The majority of the participants were students (53.61%), followed by teachers (23.71%). Other professions include housewives, employees, and various administrative roles.

Figure 1 shows the distribution of professions, highlighting the diverse occupational backgrounds of the study participants.
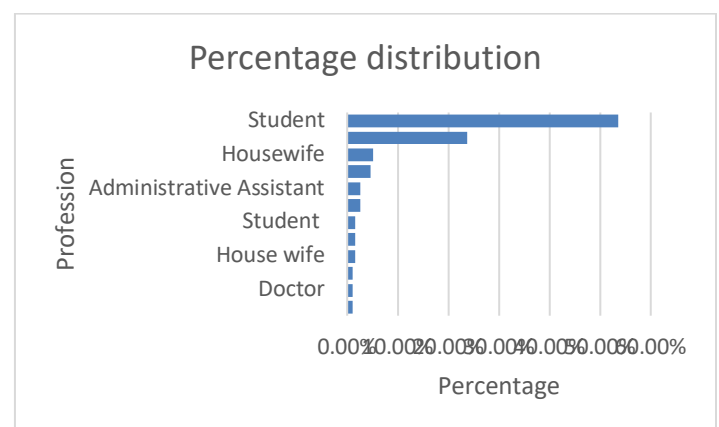
Figure 1: Distribution of profession by percentage

Table 3 details the demographic and lifestyle characteristics of study participants by gender. It includes data on age groups, professions, BMI categories, activity levels, and footwear preferences. Notably, 59% of females and 61% of males had a normal BMI, whereas 28% of females and 20% of males were overweight. Prevalence of Flat Foot.

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Table 3: Demographic and Lifestyle Characteristics of Study Participants by Gender

Basic Characteristics	Female (%)	Male (%)
Total Participants	68	32
Age Group 18-29	45	45
Age Group 30-39	21	18
Age Group 40-49	28	19
Age Group 50-60	6	18
Profession - Students	36	33
Profession - Teachers	31	27
BMI - Normal Weight	59	61
BMI - Overweight	28	20
BMI - Obesity	13	20
Activity Level - Active	28	45
Activity Level - Moderate	42	40
Activity Level - Sedentary	30	15
Shoes - Sneakers	52	60
Shoes - Open Shoes	24	33
Shoes - High Heels	7	8
Shoes - Classic Shoes	6	6

Table 4 presents the prevalence of flat foot by age group and gender. Females showed a higher prevalence of flat feet in all age groups than males. The highest prevalence was observed in the 40-49 age group for females (8%) and the 18-29 age group for males (3%). Risk Factors

Table 4: Prevalence of flat foot by age group and gender.

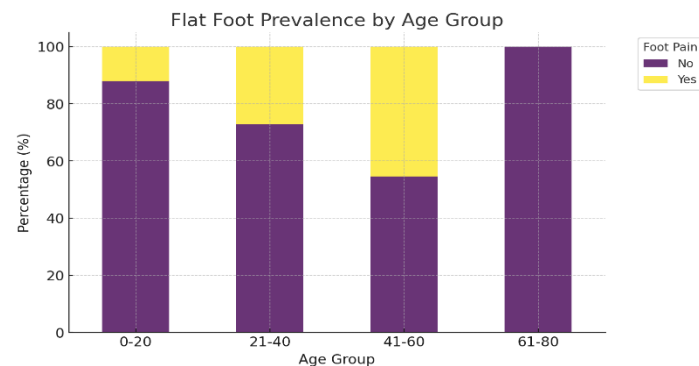| Age Group (Years)	Prevalence (%)	
	F	M
18-29	7	3
30-39	5	1
40-49	8	2
50-60	1	1

Table 5 outlines the distribution of risk factors among the flat foot cases. A high BMI was the most common risk factor, affecting 12% of females and 5% of males. Other notable risk factors include diabetes mellitus, rheumatoid arthritis, unsupportive shoes, and family history.

Table 5: Distribution of risk factors among the flat foot cases.

Risk Factor	F	M	18-29 Years	30-39 Years	40-49 Years	50-60 Years
			F	M	F	M
High BMI	18	7	8	6	7	4
Diabetes Mellitus (DM)	12	3	2	3	6	4
Rheumatoid Arthritis (RA)	8	2	1	2	3	4
Unsupportive Shoes	20	10	10	5	8	7
Family History	10	5	5	3	4	3

Figure 3 illustrates the prevalence of flatfoot and associated pain by age group, emphasizing the impact of age on flatfoot prevalence.

Figure 3: Flat foot and Pain Prevalence by age group

Discussion

The study titled "Flat Foot in Adults: Risk Factors and Its Prevalence in Jazan" provides valuable insights into the prevalence and associated risk factors of flat feet among adults in Jazan. The findings highlight significant demographic, lifestyle, and clinical characteristics that contribute to the development of flat foot, with notable differences observed across gender and age groups.

The study revealed a higher prevalence of flat foot among females than among males across all age groups. Specifically, the highest prevalence was observed in the 40-49 age group for females and the 18-29 age group for males (Table 4). This gender disparity aligns with previous research suggesting that women are more prone to flat foot due to factors such as hormonal differences, pregnancy, and footwear choices (Ahmad et al., 2022). The mean age for males and females indicates that flat foot is a concern across a broad age range.

High BMI emerged as the most common risk factor for flat foot, affecting a larger proportion of females

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than males (Table 5). This finding is consistent with existing literature that links obesity to an increased risk of flat feet due to the additional stress placed on the feet (Pourghasem et al., 2016). Other significant risk factors included diabetes mellitus, rheumatoid arthritis, unsupportive shoes, and family history (Salinas-Torres et al., 2023). Diabetes mellitus and rheumatoid arthritis affect foot structure and function, thereby increasing the risk of flatfoot (Gupta et al., 2022). The use of unsupportive shoes was also identified as a major contributing factor, consistent with findings from previous studies (Pourghasem et al., 2016), which highlight the significant impact of improper footwear on foot biomechanics and musculoskeletal health. These results reinforce the existing evidence that wearing supportive shoes plays a crucial role in preventing and managing flatfoot.

The study also examined the activity levels and footwear choices of participants. A significant proportion of participants with flat feet were moderately active or sedentary (Table 3). This suggests that lower levels of physical activity may contribute to the development of flat feet, possibly due to weakened foot muscles and ligaments. Similar findings have been reported in previous studies (Pourghasem et al., 2016), which highlighted the correlation between sedentary lifestyle and an increased prevalence of flatfoot. Research has indicated that reduced physical activity can lead to muscle atrophy and ligament laxity, further exacerbating foot arch collapse (Van Boerum et al. 2003).

Additionally, the type of footwear, particularly unsupportive shoes, was identified as a contributing factor to the flat foot prevalence. Proper footwear that provides adequate support and cushioning is crucial in preventing flat feet and maintaining overall foot health (Aenumulapalli et al., 2017).

Limitations

Despite the comprehensive nature of this study, it has several limitations. The sample size of this study was relatively small and may not be representative of the entire population of Jazan. Additionally, the higher proportion of female participants may have skewed the results. The reliance on self-reported data for certain variables such as activity levels and footwear choices may introduce bias and affect the accuracy of the findings **(Putri et al., 2024)**. The nature of the study limits the ability to establish causality between risk factors and the development of flat foot.

Future research should address these limitations by including a larger and more diverse sample size to enhance the generalizability of the findings. Longitudinal studies are recommended to establish causal relationships between risk factors and flat foot. Additionally, interventions targeting modifiable risk factors, such as weight management and the use of supportive footwear, should be explored to prevent and manage flat feet in the population. The study underscores the importance of public health initiatives focused on educating the community about the risk factors associated with flat feet and promoting healthy lifestyle choices. By addressing these factors, it may be possible to reduce the prevalence of flat feet and improve the overall foot health of the population in Jazan.

Conclusion

The study on flat foot prevalence and risk factors in Jazan highlights the significant role of demographics, lifestyle, and clinical characteristics in its development. These findings emphasize the need for public health initiatives to raise awareness about maintaining a healthy BMI, engaging in regular physical activity, and choosing supportive footwear. The higher prevalence among females suggests the importance of gender-specific approaches in prevention and treatment. This research advances the field by providing detailed insights into the interplay of various factors contributing to flat foot, offering a foundation for future studies and targeted interventions to improve foot health in the population.

Author Contributions

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All authors significantly contributed to the work reported, including conception, study design, execution, data acquisition, analysis, and interpretation. They actively participated in drafting, revising, or critically reviewing the manuscript, provided final approval of the version to be published, agreed on the journal submission, and accepted accountabilities for all aspects of the work.

Data Availability Statement

The authors will transparently provide the primary data underpinning the findings or conclusions of this article, without any unjustified reluctance. If need from editorial team.

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Conflicts of Interest

The authors declare no potential conflicts of interest related to the research, writing, or publication of this work.

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