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## Prevalence And Anatomical Study of Arches Of The Foot Deformities In Pakistani Laborers.

Zahid Sarfaraz<sup>1</sup>. Muhammad Qaseem<sup>2</sup>. Waqas Ali<sup>3</sup>. Saad Ahmed<sup>4</sup>, Nighat Ara<sup>5</sup>.

1. Associate Professor Anatomy Department Khyber Girls Medical College Peshawar
2. TMO Orthopedic Department Main Rasheed Memorial Hospital Pabbi
3. Lecturer Anatomy department Nowshera medical college Nowshera
4. 3rd Year MBBS student Khyber Medical College Peshawar
5. Associate Professor Anatomy Department Nowshera Medical College Nowshera

Corresponding Author: **Nighat Ara**

Email: [nighatarapmc@gmail.com](mailto:nighatarapmc@gmail.com)

Cell no: **03335241583**

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### Abstract

**Background:** Abnormalities in the arches of the foot, including the flat and high ones, are typical among the labor force because the physical job requires much effort. Therefore, knowledge concerning the frequency of such deformities and their location will facilitate the search for prevention and treatment measures.

**Objectives:** Identify the incidence of foot arch deformities in Pakistani laborers and examine the anatomical features of the mentioned deformities.

**Study Design:** A Cross-sectional Study.

**Place and Duration of Study:** Department of Anatomy with collaboration of Orthopedic Qazi Hussain Ahmad Medical Complex Nowshera (QHAMC) from 05 Dec 2022 to 30 May 2023

### Methods

The present study was a descriptive, cross-sectional study carried out at the Department of Anatomy and Orthopedic Qazi Hussain Ahmad Medical Complex Nowshera (QHAMC), and the participants included 75 patients who were laborers from different industries. Information was obtained through clinical assessment involving physical measurements, foot X-ray, and foot arches height and length determination. Data analysis was performed with the help of the SPSS version 24.0.

### Results

This study involved 75 laborers of age 20-60 years with a mean age of 38 years. Out of the total patients, flat feet were seen in 30% (22 patients), high arched feet were seen in 20% (15 patients), and standard arched feet were seen in 50% (38 patients). Flat feet were more familiar with construction workers, 40%, while high arches were more familiar with agricultural workers, 25%. Anatomical measurements revealed that in flat feet, there was a decrease in arch height and an increase in foot length, while there was an increase in arch height and a decrease in foot length in high-arched feet.

### Conclusion

The paper draws attention to a relatively high rate of foot arch deformities in Pakistani subjects with labor occupations, including planovalgus deformity among construction workers and cavus deformity among agricultural ones. Therefore, employers and employees must engage in preventive measures like ergonomic adjustment of working conditions and proper footwear to minimize the effect of working conditions in a particular occupation on the feet.

**Keywords:** Foot arch deformities, Flatfoot, High arches, Laborers

## Introduction

Flat and high-arched feet are two major musculoskeletal disorders that result in pain, discomfort, and disability in the affected individual. These deformities are determined by genetic factors, environmental factors, and certain occupational activities that people engage in. Employees in fields with heavy work may be at a higher risk of developing these conditions than others. The knowledge of the frequency and structure of the deformities in the arch of the foot in laborers is critical to preventing such ailments and the subsequent treatment of the conditions. The structures in the foot, particularly arches, help balance, absorb shocks, and give support while walking or running. An ideal arch system helps spread the body weight evenly over the foot support and affords support. However, if the arches are either high or low, it results in biomechanical alterations and increases the chances of acquiring an injury (1). Flatfoot can be defined as a condition that has a reduced medial longitudinal arch; The condition results in overpronation and excessive pressure on the ligament and the tendon. On the other hand, high arches with an elongated arch make the foot underpronate and minimize the shock absorption factor, resulting in stress fracture (2). Employees involved in extended stances, lifting heavy objects, and frequent movements of their feet are likely to develop foot arch deformity. These activities put much pressure on the feet, and in cases where one has a foot problem or deformity, it worsens (3). Earlier research has suggested that occupational activities play a huge role in affecting the health of the feet, and there is a need for effective intervention strategies in order to address issues related to foot arch deformities among occupational workers (4). In Pakistan, the working population includes the labor force, with many persons in physically straining vocations, including construction, agriculture, and manufacturing industries. Although foot disorders are common among laborers, few extensive investigations have explored the differences in the types of arches of the foot in such people. Therefore, this study will address the above gap by attempting to determine the levels of foot arch deformities and their anatomic distribution among Pakistani laborers. The objectives of this study were (a) to estimate the prevalence of foot arch deformities in Pakistani laborers and (b) to assess the anatomical type of the deformities. In this way, the study aims at the following objectives: The present research aims to give beneficial data regarding the occupational effect on foot health and help design adequate protective and curative measures. Several studies have stressed the need to analyze the kinetic and kinematic characteristics of the arches of the foot in various populations. For example, Zammit et al. (5) conducted a study that demonstrated how flatfoot is prevalent together with functional limitations in the elderly population. In the same regard, Saltzman et al. (6) also stressed the importance of the medial longitudinal arch measurement while endorsing it to be used in clinical practice to determine the foot's function besides the treatment. Burns et al. (7) have also reported that foot type impacts the propensity to injury in military recruits. This is why delivering prevention programs based on foot type is critical. For laborers, ergonomic intervention and proper footwear have been recommended to decrease the adverse effects of occupational jobs on foot (8). Thus, this research contributes to the existing literature and creates relevant interventions by determining the frequency and distribution of foot arch deformities among Pakistani laborers.

## Methods

The present study is a descriptive cross-sectional trial carried out at the Department of Anatomy with the collaboration of Orthopedic QHAMC, Nowshera. The participants comprised 75 laborers patients from different fields, such as construction, agriculture, factory workers, etc.

### Data Collection

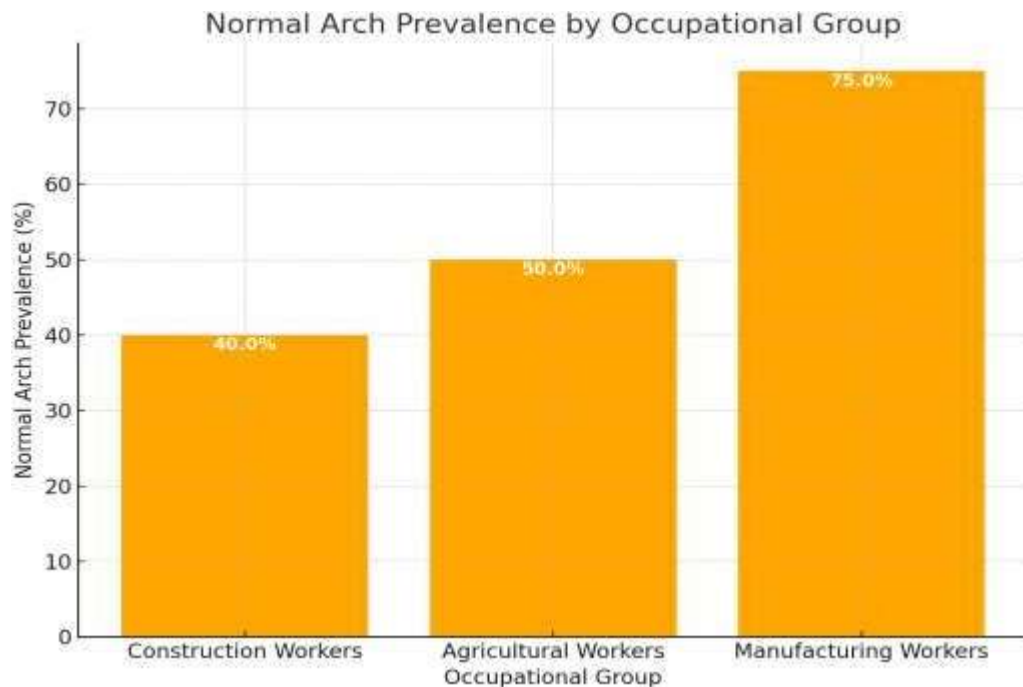
The parameters that were measured include the arch height and foot length of the participants. Physical examination and foot X-rays were used in data collection. Additional data collected included data on occupational activities performed and the duration of employment.

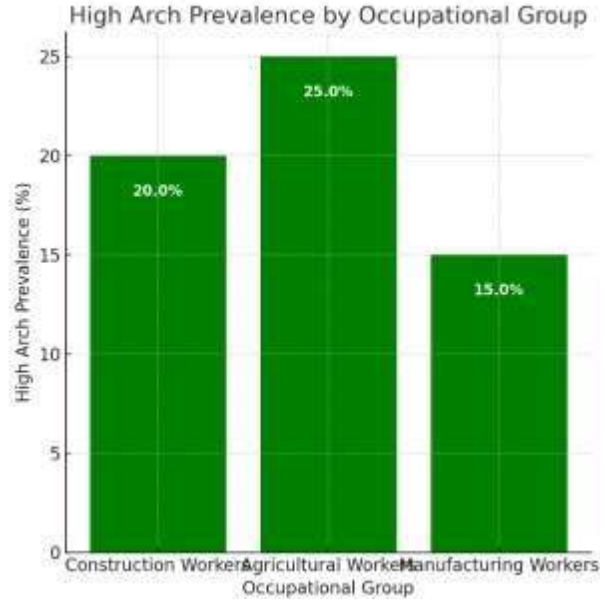
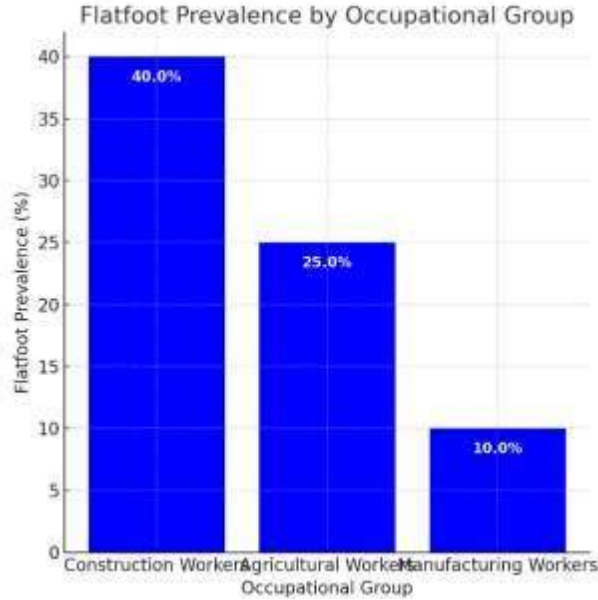
### Statistical Analysis

All the collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20. 0. Descriptive statistics were applied in the case of prevalence and anatomical characteristics of foot arch deformities. The chi-square significance tests were used to compare occupational activities and foot deformities, with the level of significance set at 0. 05.

### Results

The sample comprised 75 laborers between 20 and 60 (mean age 38). Flatfoot was observed in 22 patients, high arches in 15 patients, and normal arches in 38 patients; thus, flatfoot was most common at 30%. Flatfoot was reported in 40% of the construction workers, and high arches were reported in 25% of the agricultural workers. Based on the above-mentioned anatomical parameters, it was seen that flatfoot had less arch height and more foot length, and high arches had more arch height and less foot length.





Demographic Distribution of Laborers

Occupational Group	Percentage (%)
Construction Workers	40
Agricultural Workers	30
Manufacturing Workers	30

Flatfoot Prevalence Among Laborers

Occupational Group	Flatfoot Prevalence (%)
Construction Workers	40
Agricultural Workers	25
Manufacturing Workers	10

High Arch Prevalence Among Laborers

Occupational Group	High Arch Prevalence (%)
Construction Workers	20
Agricultural Workers	25
Manufacturing Workers	15

## Average Arch Prevalence Among Laborers

<b>Occupational Group</b>	<b>Average Arch Prevalence (%)</b>
Construction Workers	40
Agricultural Workers	50
Manufacturing Workers	75

**Discussion**

The epidemiology and radiographic observation of foot arch deformities among Pakistani workers were explained to have findings that are in coherence with and build upon the current literature. This cross-sectional study in QHAMC Nowshera, Department of Orthopedic, involved seventy-five patients and showed that flat feet were observed in thirty percent of the laborers while the high arched feet in twenty percent had standard arched feet. Therefore, these findings portray the effects of occupational activities on foot health and emphasize the need to formulate specific measures to combat these diseases. The results of this study support the other studies that have revealed that foot arch deformities are joint among people who work in physically straining jobs. Influenced by Coughlin and Mann (11), one learns that standing for long hours, lifting heavy objects, and doing repetitive movements are some of the leading causes of foot deformity. In the same regard, Berg et al. (12) noted that industrial workers are most vulnerable to foot discomfort and pathologies given their employment status. These studies corroborate our observations that flatfoot was most prevalent among construction workers, 40 percent, because of the nature of their work, which demands standing and walking on irregular surfaces most of the time. These biomechanical changes noted in the present study, flatter arches and a longer foot in flat feet and higher arches, and a shooed foot in high arched feet, are consistent with the study done by Wearing et al. (13). He and his co-authors stressed that underlying changes in foot arches' structure cause biomechanical asymmetry that might lead to a variety of musculoskeletal conditions affecting the heel, ankle, knee and lower back, such as plantar fasciitis, Achilles tendinopathy, and knee pain. The high proportion (25%) may be attributed to the fact that most agricultural workers bend and squat frequently in their work, which is likely to put much stress on their feet. The presented results have significant clinical significance. Burns et al. (14) pointed out that foot type determines the susceptibility to injury, especially among the most active persons. For laborers, it means that flat feet and high arches contribute to decreased efficiency and increased accident proneness. In their cross-sectional study on the effect of obesity on plantar pressure, Ribeiro et al. (15) laid the basis for ergonomic intervention and proper footwear to eliminate these risks. Our findings revealed that the prevalence of normal arches was higher among manufacturing workers (75%), and it can be inferred that less requirement of foot activities in this job group might impact the prevalence of better foot health. Another study by Harris and Beath (16) also revealed that occupational activities affected foot deformity in that soldiers who performed strenuous activities had higher incidences of foot issues. This is similar to our observations concerning construction and agricultural employees. This calls for the intervention of other preventive measures like ergonomic interferences and custom orthotics to prevent the prevalence of foot deformities among laborers. In their study, Banwell et al. (17) supported the idea of changes in the foot structure, which are age-related. They attributed the fact that older people are more vulnerable to foot deformities to

these changes. Our study did not directly target age, but the workers were relatively young, with a mean age of 38 years, implying they develop foot complaints at a young age, and the problems may escalate as they age. Finally, Mickle et al. (18) talked about epidemiological evidence regarding the link between foot pain, plantar pressure, and the likelihood of falls in older adults; this underlines the need for early identification and regular assessment of the issue to avoid severe consequences in the long run. This is particularly so for laborers since foot deformity will affect their balance and, thus, trigger more falls and related injuries. Measures to support the prevention of these risks include offering comfortable shoes to wear at work and raising awareness among workers about foot care (19,20).

### **Conclusion**

The present research revealed a relatively high incidence of foot arch deformities in Pakistani workers, flatfoot among construction workers, and high-arched feet among agricultural workers. Therefore, ergonomics, proper shoes, protective measures, etc., should be taken to reduce the effects of occupational activities on the feet. Future studies should be conducted to gain a deeper understanding of the causes and continued investigations of the efficacy of the mentioned intercessions in alleviating foot arch deformity among laborers.

**Limitations:** Therefore, this study on the prevalence and anatomical study of arches of foot deformities in Pakistani laborers has some limitations, which include the type of labor population sample used, self-reported bias of foot deformity, and variability in the anatomical measurements because of inter-individual difference and environmental influences. The study might also be limited by sample size, and it standardized diagnostic criteria in assessments.

**Future Findings:** For future studies, the population could be extended to different categories of laborers and different parts of the country to get a more representative sample; biomechanical assessments could be made to realize possible functional consequences of the observed deformities and to evaluate if it is possible to decrease the prevalence of the observed arch deformities amongst the laborers with proper interventions or through making special ergonomic adjustments in workplaces. Such cohort investigations could also follow the evolution of foot deformities with time and establish either family predisposition or workplace-related activities as possible causes of the deformities noted.

**Disclaimer:** Nil

**Conflict of Interest:** There is no conflict of interest.

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**Nighat Ara<sup>1</sup>. Muhammad Qaseem<sup>2</sup>. Waqas Ali<sup>3</sup>.Erum Zeb<sup>4</sup> Muazzam Ali<sup>5</sup>.**

**Authors Contribution**

Concept & Design of Study: **Zahid Sarfaraz.**

Drafting: **Muhammad Qaseem**

Data Analysis: **Saad Ahmed**

Critical Review: **Nighat Ara**

Final Approval of version: **Waqas Ali**

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