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# "A CORRELATION OF FLAT FOOT AND PROLONGED STANDING AMONG STREET VENDORS IN AHEMDABAD."

**Physiotherapy**

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## ABSTRACT

**Background:** Flat foot can lead to many unpleasant problems including heel pain, bunions, hammertoes, shin splints and even knee, hip or back pain [9]. Most cases of flat foot are caused by loose joint connections. This develops with repetitive stress on the main supporting tendon of the arch over a long period of time [3]. It is believed that Asians have less ligament laxity and accordingly lower prevalence of flat foot than Europeans and Americans [10]. The prevalence of flat feet has been investigated by many researchers in different parts of the world. Higher prevalence (21 to 57%) is reported among children of two to six years which declines (13.4% to 27.6%) in primary school children [14]. In adult population, it is reported to be approximately 5 to 14% by different researchers. The true prevalence of flat foot is uncertain due to lack of exact clinical or radiographic criteria for defining flat foot **Methodology:** Street vendors of Ahmedabad were selected for the study and asked for total standing hours in their day and flat feet were assessed by the FPI-6 score. FPI-6 is a clinical tool that classifies foot posture according to six items (Redmond, 2005): (i) palpation of the head of the talus; (ii) curvatures above and below the lateral malleolus; (iii) position of the calcaneus in the frontal plane; (iv) prominence in the talo-navicular joint; (v) the medial longitudinal arch's congruence; and (vi) abduction/adduction of the forefoot on the rear-foot. Each item is scored from −2 to 2, resulting in a total score of −12 to 12. Negative values indicate supinated foot posture and positive values indicate pronated foot posture. **Result:** The research was performed on 100 participants between the age of 20-40. There were 56 patients between the ages of 20 to 30, 44 patients between the age 31to 40. Moderately negative correlation seen in standing duration and pronation of foot. **Conclusions:** There is no correlation between standing time and flat foot in street vendors of Ahmedabad.

## KEYWORDS

Foot posture index, Medial Longitudinal Ach, Flat foot, Pes Plano-Valgus, Adult Flatfoot.

## INTRODUCTION

The structure and dynamicity of foot arches are essential for functions of foot like shock absorption, body weight transmission and to act as a lever for propelling the body forward during locomotion. Medial Longitudinal Arch (MLA) of foot is higher than the Lateral longitudinal arch and its curvature flattens to variable degree during weight bearing[1]. Pes planus is a medical condition where the curvature of MLA is more flat than normal and entire sole of the foot comes into near complete or complete contact with the ground [2]. The height of MLA is most important measurement in determining the degree of pes planus. The feet appear to be flat in infants due to presence of fat. The arches become prominent when the child starts walking and the foot starts bearing the weight. The arches of foot rapidly develop between two to six years and become structurally mature around 12-13 years. [3]

Prevalence of flat feet is higher in children due to ligament laxity and declines with age. Early shoe wearing in children impairs the development of longitudinal arches[4]. The true prevalence of flat foot is uncertain due to lack of exact clinical or radiographic criteria for defining flat foot.

Flatfoot can also be acquired in adulthood. In the adult-acquired condition, patients typically present with an insidious onset of vague pain in the medial foot and behind the medial malleolus along the course of the tibialis posterior tendon [4]. As the condition progresses, these patients have more complaints related to loss of function and changes in the shape of the foot. In the late stages, rigidity, arthritic changes, and ankle valgus may also be observed. In adulthood, the tibialis posterior tendon should maintain its integrity between the medial malleolus and navicular tuberosity When the tendon is elongated, the plantar structures such as the spring ligament stretch excessively, leading to joint subluxation.

A cross-sectional study in 24 subjects with tibialis posterior tendon abnormality and 48 sex- and age-matched controls showed that advanced tibialis posterior tendon pathology was statistically significantly associated with adult-acquired flatfoot deformity and spring ligament pathology[5]. As the pathology progresses, the medial arch collapses. This leads to compensation of the foot by forefoot supinatus and calcaneal valgus, resulting in the deformity of pes planovalgus[6]. An ankle equinus may also present as either a primary deforming force or a secondary adaptation in such patients.

Adult flatfoot is defined as a foot condition that persists or develops after skeletal maturity and is characterized by partial or complete loss or collapse of medial longitudinal arch. Adult flatfoot may present as an incidental finding or as a symptomatic condition with clinical consequences ranging from mild limitations to severe disability and pain causing major impediments. It is often a complex disorder with variety of symptoms and various degrees of deformity[7].

The human foot is designed in the form of elastic arches or springs. These arches are segmented, so that they can best sustain the stresses of weight and of thrusts. An arched foot is a distinctive feature of man[8]. Absence or collapse of the arches leads to flatfoot (pes planus), which may be congenital or acquired. The effects of a flat foot are as follows Loss of spring in the foot leads to a clumsy, shuffling gait, b) Loss of the shock absorbing function makes the foot more liable to trauma and osteoarthritis, c) Loss of the concavity of the sole leads to compression of the nerves and vessels of the sole[9].

Flat foot deformity was classified into three subtypes, rigid flat foot, Flexible Flat Foot (FFF) and Flexible Flat Foot with Short Tendo-Achilles (FFF-STA)[10]. FFF is generally asymptomatic while FFF-STA gives rise to pain and functional disability. Rigid flat foot is often symptomatic and associated with tarsal coalitions and reduced range of motion at subtalar joint.

There are many different causes of flat foot, which can be separated into 2 main categories. The first category, congenital flat foot, includes the completely asymptomatic, pediatric flexible flat foot, by far the most common form of congenital flat foot. Flexible means that an arch is present until weight is put on the foot, at which time the arch disappears. The second category, acquired flat foot, develops over time, rather than at birth, and many different factors contribute to its development. These include the type of shoes a child wears[11], rheumatic arthritis, compensation for other abnormalities further up the leg, or more severe factors such as rupture of the ligaments or tendons in the foot. The most common acquired flat foot in adults is due to posterior tibial tendon dysfunction.[12]

Flat foot can lead to many unpleasant problems including heel pain, bunions, hammertoes, shin splints and even knee, hip or back pain. Most cases of flat foot are caused by loose joint connections. This develops with repetitive stress on the main supporting tendon of the arch over a long period of time. It is believed that Asians have less

ligament laxity and accordingly lower prevalence of flat foot than Europeans and Americans.[13]

The prevalence of flat feet has been investigated by many researchers in different parts of the world. Higher prevalence (21 to 57%) is reported among children of two to six years which declines (13.4% to 27.6%) in primary school children. In adult population, it is reported to be approximately 5 to 14% by different researchers. The true prevalence of flat foot is uncertain due to lack of exact clinical or radiographic criteria for defining flat foot.[14]

Studies have found relation between these indices and their validity has been determined using diagnosis carried out with a pod scope on children as a reference group. Prevalence changes with age, the type of population studied and the presence of other pathologies. Some studies show prevalence between 26.5% and 19.0% and other studies on patients with associated comorbidity report a prevalence of 37%. Flat foot has been associated to family history, the use of footwear in infancy, obesity and urban residence, and it has also been associated with age, gender and foot length. The presence of flat foot has also been associated with the presence of different states of health, the presence of pain, and the fatigue in women. Other studies, however, find no relationship of pain or functionality with the changes in the foot. [15]

Flat foot can lead to many unpleasant problems including heel pain, bunions, hammertoes, shin splints and even knee, hip or back pain. Most cases of flat foot are caused by loose joint connections. This develops with repetitive stress on the main supporting tendon of the arch over a long period of time. It is believed that Asians (including Arabs) have less ligament laxity and accordingly lower prevalence of flat foot than Europeans and Americans.[16]

## METHODOLOGY

**Study Design And Setting**

**Study Design:** CORRELATION STUDY

**Population**: STREET VENDORS IN AHEMDABAD

**Sampling Method:** CONVENIENT SAMPLING

**Sample Size:** 100

**Selection Criteria**

**Inclusion criteria:**

- Age group between 22 to 40 years.
- Both genders– male and female.
- Subject willing to participate in study.
- Vendors with 6 to 8 hours of duty.

**Exclusion criteria:**

- Subject with any systemic illness and other musculoskeletal disorders specifically in lower limb like foot injuries, degenerative changes of hip and knee.
- Subject with any recent surgeries of lower limb.

**Outcome Measures:**

**Foot Pressure Index**

THE FOOT POSTURE INDEX (FPI) is a novel, foot-specific outcome measure that was developed in order to quantify variation in the position of the foot easily and quickly in a clinical setting. It is particularly intended for large sample studies where complex instrumented assessment (e.g., gait laboratory assessment) is impractical or unnecessary. It has already been used in studies of risk factors for injury in athletes and naval recruits, treatment of plantar heel pain, and response to orthotic therapy in different foot types. The FPI consists of a series of criterion-based observations that combine to provide a quantification of postural variation in 3 major regions of the foot (rear-foot, mid-foot, forefoot) in the 3 cardinal body planes. FPI-6 is a clinical tool that classifies foot posture according to six items (Redmond, 2005): (i) palpation of the head of the talus; (ii) curvatures above and below the lateral malleolus; (iii) position of the calcaneus in the frontal plane; (iv) prominence in the talo-navicular joint; (v) the medial longitudinal arch's congruence; and (vi) abduction/adduction of the forefoot on the rear-foot. Each item is scored from −2 to 2, resulting in a total score of −12 to 12. Negative values indicate supinated foot posture and positive values indicate pronated foot posture.

**Reliability And Validity Of Foot Posture Index:**

**Mariana R.C. Aquino et al** in their study of Reliability of Foot Posture Index individual and total scores for adults and older adults concluded that The relatively low reliability in light of this high level of agreement suggest that the current version of FPI-6 can be a useful tool to assess foot posture for adults and should be further examined. On the other hand, FPI- 6 should be cautiously used for older adults.

**Data Collection Procedure:**

After receiving the ethical committee clearance to study research from institute, participants who fulfill the selection criteria were evaluated clinically through assessment and the purpose and procedure of the study was explained to the subjects and requested to sign the consent form. Prior to study the entire subject's demographic data including age, sex, height, weight, Body Mass Index, occupation, address, etc., will be noted.Outcome measures were taken. Result was analyzed statistically using SPSS 25.0 software.

**Procedure:**

The participant stood on a step, with the arms by the side and looking straight ahead the examiners were not allowed to see the participant's contralateral foot during the evaluation of foot posture (Fig.2). The entire procedure was performed at a clinic. Each FPI-6 item was independently evaluated and scored by each examiner in separate sheets. First, the examiners evaluated the left foot, and then, the right foot.

## RESULTS

All statistical analysis was done using SPSS 25.0 software for windows. Descriptive analysis was used to obtain mean and standard deviations.

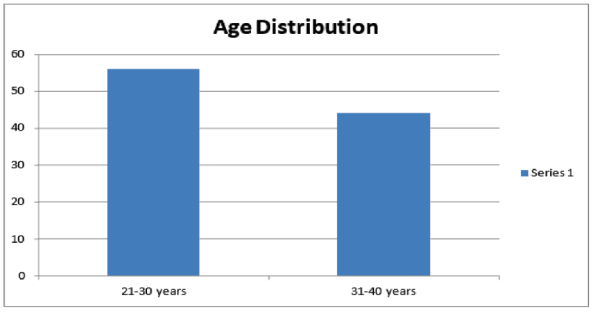
**Demographic Data**

**Age:**

The research was performed on 100 participants between the age of 20-40. There were 56 patients between the ages of 20 to 30, 44 patients between the age 31to 40.

**Table 1: Age Distribution**

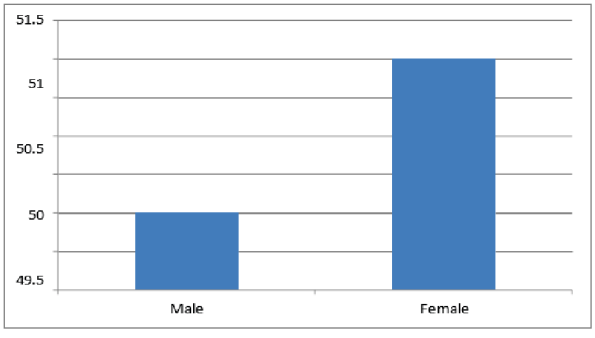
| Age Distribution | |
|---|---|
| 21-30 years | 31-40 years |
| 56 | 44 |




**Graph 1: Age Distribution**

**Gender Distribution:**

The research was performed on 100 participants between the age of 20-40. There were 49 Male participants and 51 female participants.




**Graph 2: Gender Distribution**

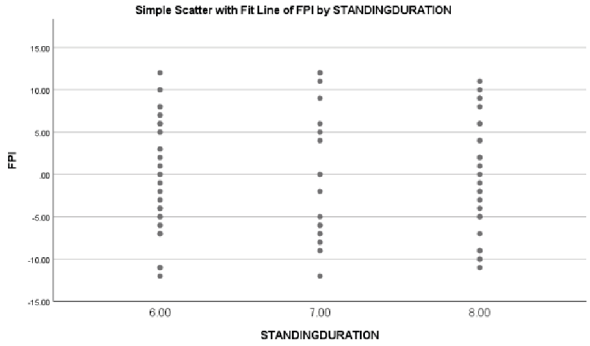
**Table 2: Mean Value Of Fpi & Standing Duration**

| | Mean + SD |
|---|---|
| Age | 27.6+4.3 |
| FPI-6 | 12.5+5.2 |
| Standing Duration | 6.3+ 0.8 hours |

**Correlations**

**Table 3: Correlations Of Fpi And Standing Duration**

| duration | | | FPI6 |
|---|---|---|---|
| Duration | Pearson Correlation | 1 | -.013 |
| | Sig. (2-tailed) | | .897 |
| | N | 100 | 95 |
| FPI6 | Pearson Correlation | -.013 | 1 |
| | Sig. (2-tailed) | .897 | |
| | N | 95 | 95 |




**Graph 3: Correlation of FPI &standing duration**

- As results are showing the person's correlation between standing hours and FPI was -0.013 that shows the moderately negative correlation seen in standing duration and pronation of foot.

## DISCUSSION

Flatfoot is a biomechanical disorder frequently seen in clinical practice. This study reveals that the prevalence of flat foot was 26.62%. Described finding is practically identical to a study conducted in Japan on a sample of 242 women and 98 men, in which a prevalence of 26.5% was observed, along with how said finding is related with obesity and the effects of pain and functionality. Similar findings regarding the prevalence of flat foot can be found in other publications. In other population studies (Springfield, Massachusetts) the prevalence of flat foot was 19.0% (20.1% in females and 17.2% in males). Another study conducted in the Boston area found a prevalence of 20% in women 17% in men. There are even studies, conducted in a diabetic population on a sample of 230 patients, which refer to a prevalence as high as 37% The present study was performed on 100 participants between the age of 20-40. There were 56 patients between the ages of 20 to 30, 44 patients between the age 31to 40. It was having mean FPI of 12.5±2.5 and mean standing hours were 6.3±0.8 hours and they show moderately positive correlation of standing hours with flat foot.

Another study conducted in India reveals how the use of footwear at early ages, along with obesity and ligamentous laxity, increases the prevalence of flat foot Another study conducted in Nigeria on 560 children aged between six and 12 years shows that although in the univariate analysis an association was found with type of footwear and age, after taking both into consideration, only age remained as a variable associated the presence of flat foot. Urban residence as a risk factor for the prevalence of flat foot has also been described in a study conducted on children in the Congo, where, after studying 1,851 footprints from 906 girls and 945 boys aged between three and 12 years, it was observed that prevalence diminishes with age, is higher in urban areas and in the masculine sex, and that the use of footwear has little influence on said prevalence. This study shows how the BMI, comorbidity and foot size are associated with the prevalence of flat foot. There is variability in the literature review. A number of studies describe how this foot disorder increases with age, other studies describe how flat foot diminishes with age, after adjusting for other covariates, and others indicate that neither age, gender nor BMI are related with flat foot. Also in another study, the prevalence of flat foot was assessed where in it was found that real prevalence of symptomatic flatfoot is not very high in adolescents due to its nature of spontaneous correction as age increases also in another study, the prevalence of flat foot was assessed where in it was found that real prevalence of symptomatic flatfoot is not very high in adolescents due to its nature of spontaneous correction as age increases [18, 19]. According to age, the subjects between age 20-29 years were suffering 31.8% of flat foot, 30-39 years were having 42% flat foot, 40-49 years were having 16.7% flat foot, above 50 years were having 37.5% flat foot. similarly subjects between age 20-29 years were suffering 47.7% of high arched foot, 30-39 years were having 50% high arched foot, 40-49 years were having 61.1% high arched foot, above 50 years were having 50 % high arched foot.

According to gender it was found that high arched foot had higher incidences in males (55.2%) whereas flat feet were found to have higher incidences in females (38.7%).

A number of studies also describe different radiological findings in the morphology of the foot according to different ethnic groups. Others indicate how the different radiological morphology (angle of the talus with the first metatarsal) is related with the symptomatic presence or absence of flat foot. Even though obesity has repeatedly been associated with the presence of flat foot, not all studies point towards this association. In some articles, not only is the association of flat foot with characteristics (e.g., age, sex, BMI and concomitant illness) indicated, but also as a modifier of health. Thus, there are studies of 97,279 military recruits which associate flat foot with localized knee pain. As we have previously mentioned, in the article which finds a prevalence of flat foot identical that in our study it can also be seen how said alteration is also associated with the presence of pain and fatigue in women.

## CONCLUSION

According this study, standing duration was negatively correlated with pronation of foot in vendors of Ahmedabad city. Its suggest that flat foot is not correlated with long standing duration in vendors.

### Abbreviations

FPI: Foot Pressure Index, NPRS: Numerical Pain Rating Scale, VAS: Visual Analogue Scale, ROM: Range of Motion.

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