

PREVALENCE OF FLAT FOOT AND HIGH ARCHED FOOT IN NORMAL WORKING INDIVIDUALS USING FOOTPRINT METHOD

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ABSTRACT

Background: Flat foot and High arched foot are common conditions encountered in our daily clinical practice. These foot conditions can lead to other complications.

Objective: To find out the prevalence of flat foot and high arched foot in normal healthy working individuals.

Methods: 60 subjects were selected for the study. All patients' feet were assessed by footprint method and were categorized into flat feet and high arched feet based on their imprints.

Results: Prevalence in a population of 20 to 60 years old normal working individuals was 34.2% for flat foot, 50.8% for high arched foot and 15% of normal foot for all subjects.

Conclusion: The results conclude that high arched foot is more prevalent in normal healthy working individuals.

KEY WORDS: Foot Deformities, Prevalence, Working Individuals, Stress Fractures.

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INTRODUCTION

Human foot shows a system of three arches capable of being flattening and recoiling somewhat by pressure from above thus bearing elasticity. One arch runs transversely and two arches run longitudinally. The longitudinal arch starts from the calcaneal tuberosity and attaches to scaphoid, three cuneiform and inner three metatarsals. The transverse arch attached to scaphoid three cuneiforms cuboid from the tarsus and five metatarsals [1].

Flatfoot is a deformity which is common congenital nonpathological foot morphology or develops after skeletal maturity is reached which also is most commonly referred to as adult-

acquired flatfoot deformity [2, 3]. Normally there is pronation movement at the subtalar joint which is the coupled component movements of eversion of the calcaneus and plantar flexion and adduction of the head of the talus. This leads to lowering of the medial longitudinal arch and a bulging or convexity in the plantar medial midfoot. Due to the displacement of the talus bone, the navicular bone is depressed, which leads to tension in the spring ligament and causes lengthening of the tibialis posterior and abductor hallucis muscle. This displacement also called as Subtalar joint pronation is a normal foot motion in toddlers. There is associated weakness toe extensor and flexor digitorum

brevis. the peroneal muscles tend to be tight. A foot that appears fixed in this position often is called "pronated," pes planus, or flat foot [4, 5]. By 7 years of age, no calcaneal eversion should be present. [6]

Hereditarily, widespread ligamentous slackness increased BMI; in addition to type of shoe-wearing in early infancy plays an important role in flatfoot in many of the other precipitating factors. But the exact root cause is not known [7]. The individual usually complains about achy feeling in the feet at the end of the day. This is because of the flat foot relies more on the active contraction of the intrinsic muscles for maintaining the arches which results into over-use, fatigue, and an "achy feeling" at the end of the day. This is due to an inflammatory response caused over time [5].

High arched foot or Pes cavus is a deformity which consists of an excessively high medial longitudinal arch in the foot. Normally there is supination movement at the subtalar joint. The calcaneus is noticeably inverted, the medial longitudinal arch height is noticeably high, and the talonavicular joint is associated with talar abduction and dorsiflexion. A foot which appears fixed in this position often is called "supinated," pes cavus, or high arched foot [8, 5].

Pes cavus can have an idiopathic or a neurological cause. It is very difficult to manage these patients clinically because the mechanism of foot pain related to pes cavus is poorly understood. Idiopathic pes cavus is a leading cause for individuals to seek medical help [8].

Most of the individuals who have either of the foot deformity do not show any symptoms; therefore they don't take any treatment. Most of the inflexible or aching flat feet require the need of orthopaedic or surgical management. The requirement of orthopaedic management or surgery is still controversial in the cases of asymptomatic flat feet [9].

These two deformities of the foot can have a variety of after effects on the human body. Individuals with either of the foot deformities have increased incidence of stress fractures compared to the ones with average arch height who perform high stress activities [10].

Other most common conditions involved with

foot deformity are Achilles tendinitis and knee pain [11].

It is well known fact that patients with Pes Planus most often complain of back pain. Also bilateral flat feet may lead to increase in lordosis at the lumbar spine. Also there is increased risk of developing stress fracture at tarsal/metatarsal bones stress fractures [11, 12]. The knee joint function is affected to a greater extent as a result of weight-bearing pronation in the erect standing posture which leads to knee varus [13].

In a cavus foot, most of the weight is born on the outer side. Due to constant pressure there is higher incidence of formation of plantar callus. Also this foot is unable to adapt to the uneven surfaces. There is high incidence of formation of a knee valgus which may lead to further arthritic changes. Individuals with pes cavus have been proven to suffer more femoral stress fractures as compared to others [14].

As a lot of after effects are associated with foot deformities, it's important to include the clinical evaluation of these in a general physical exam of low back or knee pain. Also as it helps us to know the existence and magnitude of causal effects of the same it's important to know its prevalence. In this way the knee and low back pain can be correlated with the existence of these deformities.

MATERIALS AND METHODS

In this study, 60 normal healthy individuals randomly participated at Inamdar multispecialty hospital. Subjects included were 1) both genders 2) age group from 20 to 60. Subjects were excluded if they had 1) recent Fractures or surgeries 2) open Wounds 3) Skin Infection 4) allergic to ink or paint 5) extreme deformities 6) already diagnosed cases.

The study was approved by the Institutional Ethical Review Board. The purpose of the study was explained and informed consent was obtained from all individuals.

Procedure: Foot print method was used in order to assess the foot arch [15]. Normal healthy individuals were randomly selected from a sample of 60. Plate on which some ink was spread and blank sheets were used in order to conduct the study. The individuals were asked

to place their one by one in the ink plate. The individuals were asked to first place their right foot in the ink with equal weight borne on both feet and were then asked to place their feet over a blank sheet. In this similar manner the left foot was assessed. Based on their foot prints the individuals were categorized. If the foot print was found to have increased area of ink then it was categorized as flat foot and reduced area of the print was categorized as high arched feet. As a result we had a total foot sample size of 120.

STATISTICAL ANALYSIS AND RESULTS

The data on categorical variables is shown as n (% of subjects). The statistical significance of difference of categorical variables is tested using Chi-Square test. All the results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly. In the entire study, the p-values less than 0.05 are considered to be statistically significant. All the hypotheses were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference). The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS ver 21.0, IBM Corporation, USA) for MS Windows [16].

Table 1: Prevalence of flat foot and high arched foot.

Right/Left	No. of cases	% of cases
Flatfoot	41	34.2
High arched	61	50.8
Normal	18	15
Total	120	100

Of 120 feet examined, 41 (34.2%) had flatfoot, 61 (50.8%) had high arched foot and 18 (15.0%) had normal foot prints.

Graph 1: The distribution of overall prevalence of flat foot and high arched foot.

Overall Prevalence of Flatfoot and High Arched Foot

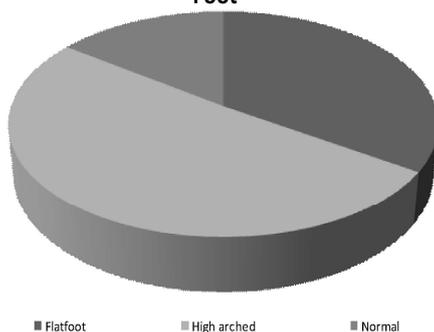


Table 2: The distribution of prevalence of flat foot and high arched foot according to age.

	Age Group (years)								Total	P-value	
	20-29		30-39		40-49		>50				
Right/Left	n	%	n	%	n	%	n	%	n	%	
Flatfoot	14	31.8	21	42	3	16.7	3	37.5	41	34.2	0.266NS
High arched	21	47.7	25	50	11	61.1	4	50	61	50.8	0.814NS
Normal	9	20.5	4	8	4	22.2	1	12.5	18	15	--
Total	44	100	50	100	18	100	8	100	120	100	

Values are n (% of subjects). P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. NS-Statistically non-significant (P-value>0.05).

The prevalence of flatfoot did not differ significantly across various age groups of subjects studied (P-value>0.05).

The prevalence of high arched foot did not differ significantly across various age groups of subjects studied (P-value>0.05).

Graph 2: The distribution of prevalence of flat foot and high arched foot according to age.

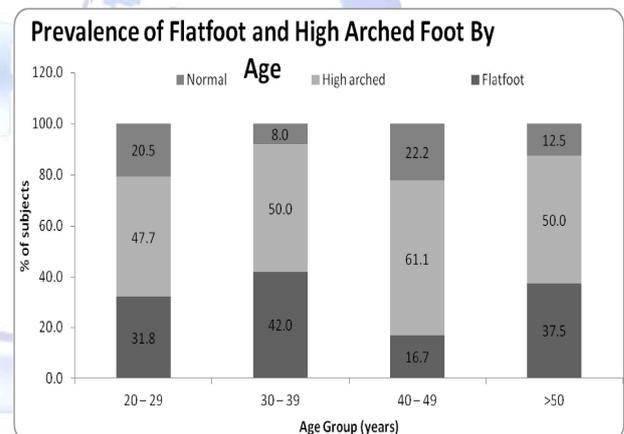


Table 3: The distribution of prevalence of flat foot and high arched foot according to gender.

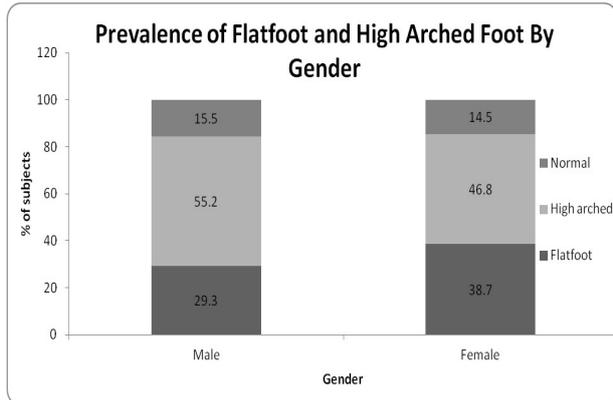
	Gender				Total	P-value	
	Male		Female				
Right/Left	n	%	n	%	n	%	
Flatfoot	17	29.3	24	38.7	41	34.2	0.278NS
High arched	32	55.2	29	46.8	61	50.8	0.358NS
Normal	9	15.5	9	14.5	18	15	--
Total	58	100	62	100	120	100	

Values are n (% of subjects). P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. NS-Statistically non-significant (P-value>0.05).

The prevalence of flatfoot did not differ significantly between male and female group of subjects studied (P-value>0.05).

The prevalence of high arched foot did not differ significantly between male and female group of subjects studied (P-value>0.05).

Graph 3: The distribution of prevalence of flat foot and high arched foot according to gender.



DISCUSSION

The above study was conducted to determine the prevalence of flat foot and high arched foot amongst healthy individuals. Flat feet and high arched feet are most commonly found in ones clinical practice. The true prevalence for either flat feet or high arched feet is controversial. These deformities if when overlooked can lead to painful outcomes.

Out of 120 sample size, the incidence of flat foot and high -arch foot was found in 41 subjects (34.2%) and 61 subjects (50.8%) respectively, while rest 18 subjects (15%) had normal foot arches (table and graph 1). This could be due to the reason that flat foot gets spontaneously resolved after the first decade. In contrast to this, lot of studies have found that flat foot is more prevalent than high arched foot. In a study conducted by tariq et al. it was found that individuals had flat feet more prevalent than high arched foot. Few authors take into consideration high-arched foot in their analyses as it is difficult to compare the results obtained with the ones achieved in other studies [17].

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. Results exhibit no major significance according to age (table and graph 2).

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%) although results were not significant (table and graph 3).

Based on the statistical analysis our results conclude that high arched foot is most common deformity found in normal healthy individuals.

CONCLUSION

We concluded that the prevalence of pes-cavus and pes-planus in a selected population of normal healthy working individuals was 50.8% and 34.2% respectively.

Moreover there are multiple other methods to check the validity and reliability of an individual suffering from foot deformities. Latest advancement in technology is there to measure the deformities more accurately like foot scanners and podometry etc.

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Conflicts of interest: None

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