

Original article:

Prevalence of flat foot among 18 -25 years old physiotherapy students: cross sectional study

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Abstract

Background: Pes-planus ('flat foot') is one of the most common conditions observed in adult health practice. The objective of our study was to find out prevalence of flat foot in a population of 18 to 25 year old physiotherapy students and to find out correlation of BMI with arch index

Methodology: A cross sectional study was conducted with sample of 80 physiotherapy students fitting in inclusion criteria. Different outcomes of the study that is navicular drop test, arch index, foot posture index was assessed for each subject.

Result : Prevalence of flat foot in a population of 18 to 25 years old physiotherapy students was 11.25% for all subjects affected with bilateral flat foot. According to the age, 18 years were having 2.5% of flat foot bilaterally, 19 years were having 3.75% flat foot bilaterally, 22 years were having 3.75 % flat foot bilaterally, 24 years were having 1.24% flat foot bilaterally. The mean Navicular drop test value was 11.11 for all subjects affected with bilateral flat foot and 6.66 for normal subjects & pronation score (FPI) for flat foot subjects mean was 7.44 (+6 to +11) bilaterally.

Conclusion: From our study we concluded that, prevalence of flat foot in a population of 18 to 25 years old physiotherapy students was 11.25% and all subjects affected with bilateral flat foot. There was no significant difference according to gender & there is no correlation of BMI with arch index.

Key Words: Flat Foot, Arch Index, Navicular Drop test, Foot Posture Index.

Introduction

Pesplanus ('flat foot') is one of the most common conditions observed in adult health practice.^[1] The true prevalence of flatfoot is unknown, primarily because there is no consensus on the strict clinical or radiographic criteria for defining a flatfoot.^[1] But some authors reported that the prevalence of flexible flatfoot in children, (2 to 6 years of age) is between 21% and 57%, and the percentage has decreased to 13.4% and 27.6% in primary school children.^[2] Literature on the incidence and symptomatology of adult flatfoot is limited. Ferciot estimated a 5% incidence of flatfoot in all children and adults.^[3] Harris and Beath studied 3,619 Royal Canadian Army recruits and found that 15% had a simple hypermobile flatfoot, 6% had simple hypermobile flatfoot with a tight heel cord, and 2% had a tarsal coalition.^[4]

The development of foot arch is rapid between 2 and 6 years of age and becomes structurally matured around 12 or 13 years of age. A flexible flat foot has an arch that is present in open kinetic chain (non-weight bearing) and lost in closed kinetic chain (weight bearing). A rigid flatfoot has loss of the longitudinal arch height in open and closed kinetic chain, generic classification of flat foot deformities that differentiated between flat feet due to physiological and pathological etiologies. Causes of flat foot can be Congenital flat foot, adult flexible flat foot, posterior tibial tendon dysfunction, tarsal coalition, peroneal spastic flat foot, latrogenic, post traumatic arthritis, Charcot foot, neuromuscular flat foot.^[5]

Foot and ankle specialists agree that flatfoot is a frequently encountered pathology in the adult population. Adult flatfoot is defined as a foot condition that persists or

develops after skeletal maturity and is characterized by partial or complete loss (collapse) of the medial longitudinal arch.^[6]

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 life impediments. The adult flatfoot is often a complex disorder with a diversity of symptoms and various degrees of deformity. Pathology and symptoms are caused by structural loading changes along the medial foot and plantar arch, as well as by collapse through the midfoot and impingement along the lateral column and rearfoot. Muscles in the leg and foot tend to fatigue and cramp because of overuse.^[8]

Till date majority of studies on prevalence of flat foot are conducted on Children below 10 years of on the adults, but minimal literature is available with studies on 18-25 years age group. Arch index, Navicular drop test and FPI are the common method for assessing prevalence of flat foot. Hence this study was undertaken to find out Prevalence of flat foot in 18 -25 years old physiotherapy students and to find out co relation of BMI with arch index.

Material and Method

This cross sectional study was conducted in PDVVPF's, College of Physiotherapy, Vilad, Ahmednagar between April – 2013 to May 2013 which included 80 physiotherapy students. Convenience sampling method was followed for the study. The Ethical clearance was obtained for the study from Institutional Ethical Committee (IEC). Written informed consent was obtained from all the subject fitting in inclusion criteria. Initially the demographic data that is Name, Age, Gender, Height, Weight & BMI was assessed. After that subjects were assessed for navicular drop test, arch index, foot posture index

ARCH INDEX:^[7] Each subject asked to deep the both the foot in the foot tray containing blue ink. Then he was asked

to walk on the white floor or on the white paper strips. Using foot print method a foot axis was drawn from the centre of the heel to the tip of the second toe & the foot print will be divided into equal thirds by constructing lines tangential to the foot axis. AI was calculated as the ratio of area of the middle third of the foot print into the entire foot print area. The lower the arch the higher the AI. (Photo

No:1) NAVICULAR DROP TEST:^{[9],[10],[12]} For checking navicular drop test, the subject was first positioned in standing i.e. weight bearing position. Using a small rigid ruler, the height of the navicular bone was measured from the floor to the most prominent part of navicular tuberosity when in the neutral talar position. Again the height of the navicular bone was measured in relaxed sitting position i.e. non weight bearing. The difference in measurement is the navicular drop and drop >10mm will be regarded as pes planus. (Photo no.2)

FOOT POSTURE INDEX:^[11] For checking the FPI, the subject was positioned in standing & the foot was in observed 3 direction by the physiotherapist i.e. anterior, medial, posterior directions. FPI was assessed using following six criteria: 1) Palpation of the head of the talus, 2) Observation of the curves above and below the lateral malleoli, 3) The extent of the inversion/eversion of the calcaneus, 4) The bulge in the region of the talo-navicular joint, 5) The congruence of the medial longitudinal arch and 6) The extent of abduction/adduction of the forefoot on the rearfoot. The master chart was prepared using scores of all three outcome. (ANNEXURE – I)

Result

Gender wise distribution of subject in which 17% subject include in males & 83% include in females.

Subject according to BMI: 27 subjects were underweight i.e. <18, 44 subjects were having normal weight i.e. 18-24.9, 8 subject were overweight i.e. 25-29.9, 1 subject having grade I obesity i.e. 30- 34.9.

Table No. 1- Distribution of arch index according to BMI.

Subject no	BMI		Arch index	
			RIGHT	LEFT
27	<18	Underweight	0.47	0.47
44	18-24.9	Normal	0.44	0.44
8	25-29.9	Overweight	0.53	0.53
1	30-34.9	Grade-I obesity	0.55	0.55

Graph No.1-Distribution of arch index according to BMI

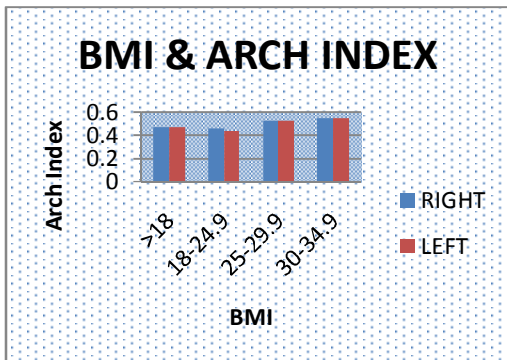


Table No. 1 shows distribution of arch index according to BMI

Graph No.2- Correlation between BMI & arch index (Right foot)

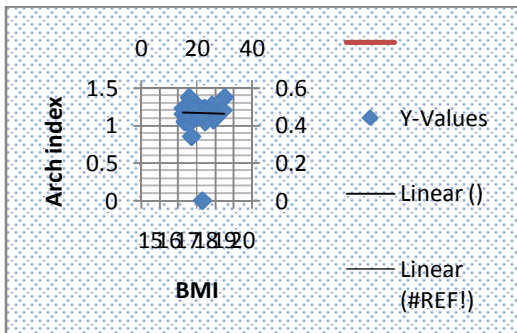


Table No. 2 shows that there is no co-relation of BMI with arch index in right foot.

Table No.4- Distribution of subject according to navicular drop test score.

	NO. of subject with score >10mm	No. of subject with score <10mm
No. of subject	9	71
Percentage (%)	11%	89%

Graph No.-3 Correlation between BMI & arch index (Left foot)

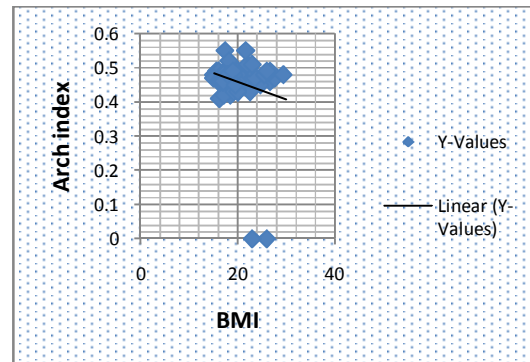


Table No. 3 shows that there is no co-relation of BMI with arch index in left foot.

Graph No.4- Distribution of subject according to navicular drop test score.

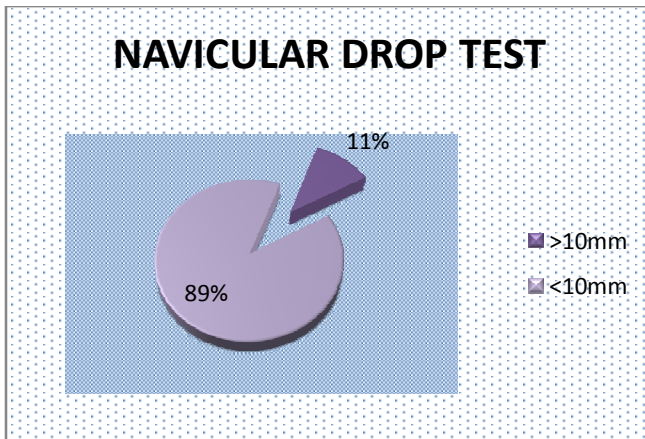


Table No. 4 shows distribution of subject with navicular drop test score < 10mm,> 10mm base on navicular drop test in that 9(11%) of subject were having score > 10mm (flatfoot)& 71(89%) of subject were having score <10mm (normal).

Table No.5- Distribution of subject according to Foot posture index.

	No.of subject with score 0 to +5 (Normal)	No.of subject with score +6 to +9 (Pronated)	No.of subject with score -1 to -4 (supinated)	No.of subject with score -5 to -12 (Highly supinated)
No. of subject	61	9	8	0
Percentage(%)	79	11	10	0

Graph No.5- Distribution of subject according to Foot posture index.

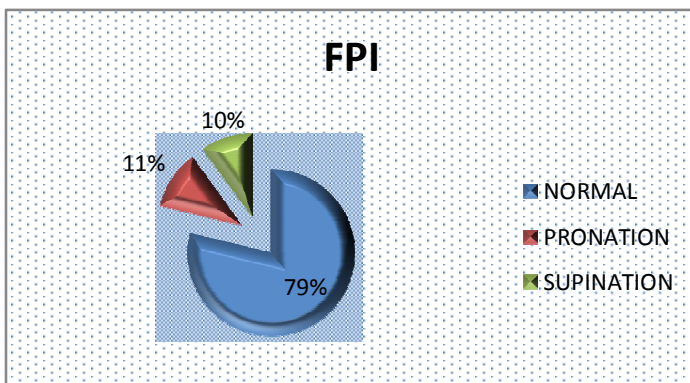


Table No.5 shows distribution of subject according to foot posture index, in that 79% subject were having normal FPI,11% subject were having

pronated FPI, 10% subject were having supinated FPI, no one was having highly supinated FPI.

Discussion

Our study was to find out the prevalence of flat foot in a population of 18 to 25 year old Physiotherapy students. By the careful examination of the foot prints of 80 subjects, the presence of bilateral flat foot was determine in 9 subjects (11.25%), vs. 71 subjects (88.75%) with normal arch. According to age 18 years were having 2.5% of bilateral flat foot, 19 years were having 3.75% bilateral flat foot, 22 years were having 3.75% bilateral flat foot, 24 years were having 1.25% bilateral flat foot.Result shows no significant difference according to gender & there was no correlation of BMI with arch index.FeridunÇilli, M.D., ÖzcanPehlivan, M.D., KenanKeklikçi, M.D.,et al in their

study on prevalence of flatfoot reported in the literature^[13,14,15] is usually for children younger than 8-10 years old and differs among age groups. As the age of the group increases, prevalence of the flatfoot decreases due to its benign nature of spontaneous correction. It was reported that^[15] 43% of children had moderate and 14% had severe flatfoot in the age group of 2-3 years. The prevalence dropped to 31% for moderate and 9% for severe flatfoot in the age group of 3-4 years, 24% for moderate and 4% severe at age group of 4-5 years, and 19% for moderate and 2% for severe in the age group of 5-6 years. In a different study,^[16] it was also reported that the prevalence of flatfoot was 16.4% in the age group of 8-10 years. Our study group includes boys and girls of 18 and 25 years old. Prevalence of the bilateral flatfoot in our group was 11.25%. Considering our result and spontaneous resolution after the first decade, it can be said that real prevalence of symptomatic flatfoot is not very high in adolescents. Saša Milenković et al in their study found that in adults, the flexible flat foot may be regarded as the normal contour of a strong and stable foot, rather than the result of weakness in foot structure or weakness of the muscles in the foot. No associated complaints were reported among studied cases.^[8] In our study pronation score (FPI) for flat foot subjects mean was 7.44(+6-+11) bilaterally. In previous study by Martin Pfeiffer et al the average valgus varied significantly with age: the 3-year old children had a mean valgus of 6.4° (range: 2–24°), but the

valgus was reduced to 4.5° (range: 2–13°) in the 6-year-old children.^[17] Medial arch improves with increasing age, very quickly up to 6 years, slowly up to 10 years, and without significant change thereafter.^[18-22] Hassan Daneshmandi et al found that obese children have a greater tendency for flat foot than normal-weight children.^[23] Our results disagree with those found elsewhere. But the reason for this may be the minimal number of obese subjects in our study. From our study the Navicular drop test mean value was 11.11mm for all subject affected with bilateral flat foot and 6.66 for normal subjects. Rasmus G Nielsen et al in from their study concluded that measurement of the static ND might be the most appropriate technique for the clinical assessment of foot pronation.^[9,24] Therefore simple and reliable methods to measure dynamic ND are highly warranted.

Conclusion

From our study we concluded that, prevalence of flat foot in a population of 18 to 25 years old physiotherapy students was 11.25% for all subject affected with bilateral flat. According to age 18 years were having 2.5% of flat foot bilaterally, 19 years were having 3.75% flat foot bilaterally, 22 years were having 3.75 % flat foot bilaterally, 24 years were having 1.24% flat foot bilaterally. There was no significant difference according to gender & there was no correlation of BMI with arch index.

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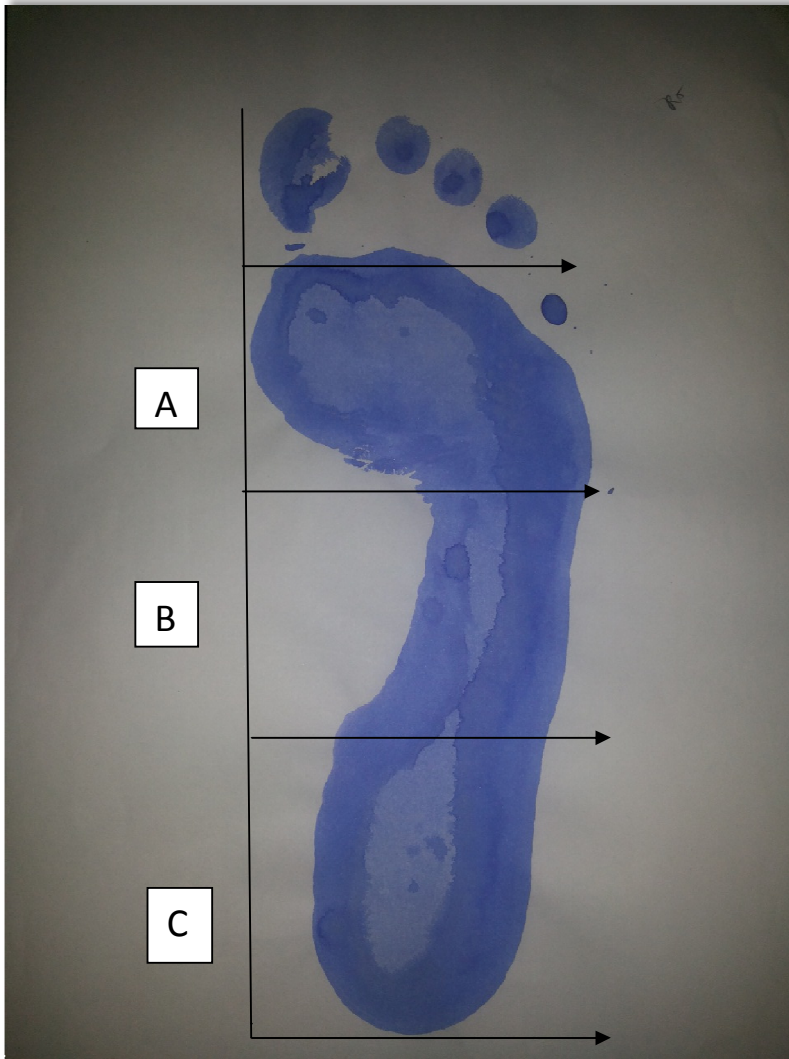


Photo No: 2



Photo No: 2 Navicular drop test

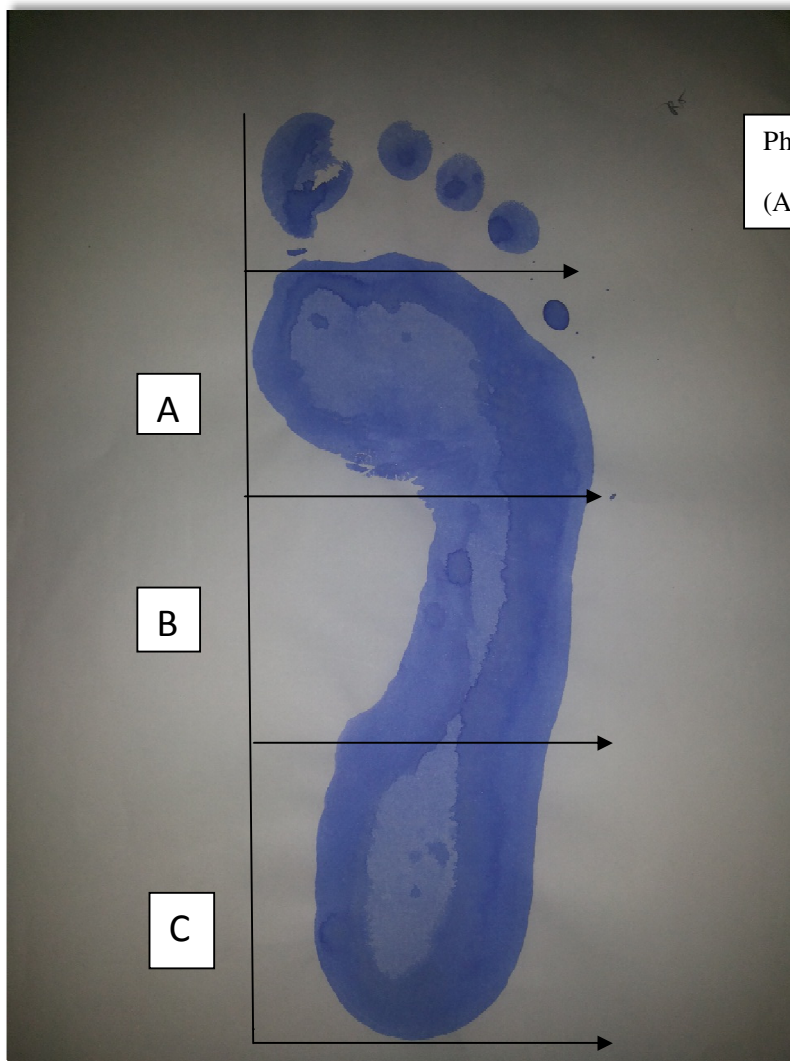


Photo no : 1 Arch index
(AI: $B/A+B+C$)

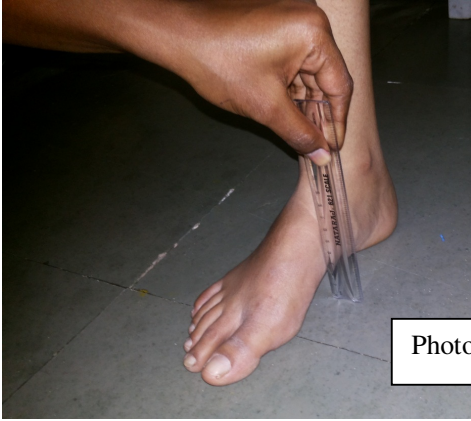


Photo No: 2 Navicular drop test