

To Establish Whether Diagnosis of Flat Foot Deformity by Staheli's Plantar Arch Index Is As Reliable As Radiological MethodSrvanathi Repalle¹, D. Chandra Shekhar², Spandana Thrikkovallur³¹Assistant Professor, Anatomy Department, Kakatiya Medical College, Hanumakonda²Associate Professor, Anatomy Department, Government Medical College, Sangareddy³Senior Resident, Anatomy Department, Government Medical College, Suryapet

Received: 27-6-2023 / Revised: 24-07-2023 / Accepted: 23-08-2023

Corresponding author: Dr. D. Chandra Shekhar

Conflict of interest: Nil

Abstract:**Background & Method:** The aim of the study is to establish whether diagnosis of flat foot deformity by Staheli's plantar arch index is as reliable as radiological method. Detailed history was taken regarding the complaints of both foot, past history, history of injury, as well as family history. Careful clinical examination was done under guidance of expert from orthopedic/physiotherapy department and Signs were recorded.**Result:** Observation shows that the Average PI value is 1.29 for both feet. SD for right is 0.09 and for left is 0.08. Minimum PI values are 1.17 and 1.16 for right and left feet. Maximum PI value for right and left foot is 1.91 and 1.47 respectively. Correlation between radiological angle (TFM angle) and plantar arch index PI is significant for both the sides with correlation value 0.31 for right side and 0.46 for left side and p value $p < 0.05$ for both the side**Conclusion:** Correlation between radiological diagnosis and foot print methods was established. Study concluded that there is significant correlation between PI and TFM angle ($P < 0.05$). Hence we can conclude that for diagnostic tool foot print method is as effective as radiological method.**Keywords:** diagnosis, foot, deformity, Staheli's & radiological.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The term pes planus denotes accessibly flat foot, there is no precise degree of flatness that defines the pes planus.[1] Pes planus (flat foot) – for convention refers to loss the normal medial longitudinal arch.[2] Flexible flat foot is defined as –hyper mobile foot excessive hind foot valgus and minimal medial longitudinal arch height when weight bearing. Condition in which the arch /instep of foot collapses & comes in contact with ground.[3]. A flat foot in its simplest term is defined as collapsing of the foot resulting in loses of arch height. In some uncommon severe cases calluses may appear due to the pressure when the bones make contact with the floor or hard surfaces. Loss of joint stability may alter the foot's ability to absorb the load and conform to uneven ground surface. Rarely, the flat foot deformity may get worse with age due to excess pressure on the soft tissues can lead to the problems such as malalignment of patella, hallux valgus (bunions), and rotation of the knee and hip[4]. Flat foot deformity is due to the result of the tarsal coalition, it can lead to the severe pain in the foot and ankle which does not resolve after a normal healing period[5]. Symptoms of pain may combine with

decrease motion and foot deformity suggests a more serious problem in the foot[6].

Material & Method

Present study was conducted at Tertiary Care Centre for 01 Years. The subjects under study were categorized into three groups according to age and sex. Age groups ranging between 05 years to 11 years. Detailed history was taken regarding the complaints of both foot, past history, history of injury, as well as family history. Careful clinical examination was done under guidance of expert from orthopedic/physiotherapy department and Signs were recorded. For obtaining the foot print by ink method following material was used:

Inclusion Criteria

- Children attending the OPD with foot problems, and apparent flat foot.

Exclusion Criteria

- Subjects with age group below 5 year and above 11 years.
- Orthopedic surgeries or serious traumas on limbs.

- Relevant clinical condition like palsy sequels, myelomeningocele, meningitis sequels.etc.
- Congenital anomalies of feet other than flat feet.

Results

Table 1: Distribution of obese subjects into cases and controls according to age groups:-

Age groups	Obese Male		Obese Female		Total
	Cases	Controls	Cases	controls	
Group I / 5 -7 years	03	02	02	02	09
Group II / 7-9 years	04	02	02	02	10
Group III / 9-11 years	03	02	02	01	08
Total	10	06	06	05	27

In the study group percentage of male obese subjects are clearly higher (59.2%) than the obese female (40.8%). It is observed that percentage of obese male cases is higher (62.5%) than the percentage of obese male controls (37.5%). and in same way percentage of obese female cases is higher (54.54%) than the percentage of obese

female controls (45.46%). It is concluded from above that obesity is associated with low or absent MLA.

Average, minimum, maximum and SD (standard deviation) values for plantar arch (PI) index are calculated for right and left feet separately for cases and control groups.

Table 2: Average, minimum, maximum and SD (standard deviation) values for plantar arch (PI) index for right and left feet for cases :-

PI	Right feet	Left feet
Average	1.29	1.29
SD	0.09	0.08
Minimum	1.17	1.16
Maximum	1.91	1.47

Observation shows that the Average PI value is 1.29 for both feet. SD for right is 0.09 and for left is 0.08. Minimum PI values are 1.17 and 1.16 for right and left feet. Maximum PI value for right and left foot is 1.91 and 1.47 respectively.

Table 3: Correlation between TFM angle [radiological angle] and plantar arch index value for case group

	Correlation value	P value	Significant level
Rt. Feet	0.31	P<0.05	Significant
Lt. feet	0.46	P<0.05	Significant

Correlation between radiological angle (TFM angle) and plantar arch index PI is significant for both the sides with correlation value 0.31 for right side and 0.46 for left side and p value $p < 0.05$ for both the side.

Discussion

According to observation of present study, it is observed that incidence of flat foot was more in male children (58%) than female children (42%)[7]. Bordin D et al [8] did their study on flat and cavus foot, indexes of obesity and overweight in a population of primary-school children. They evaluated the incidence dysmorphism in a population of 243 primary-school pupils, (3rd and 4th class - age range 8-10 years) of ULSS no. 16 in Padua and, the incidence of flat foot in the population studied was found to be 16.4%, of which 18.1% were males and 14.6% females.

Martin Pfeiffer, MD et al [9]. Determine prevalence of flat foot in preschool-aged children in August, 2006. study was conducted on 3 to 6 year

old children (boys – 424, girls 411). A laser surface scanner and the measurement of rear foot angle were used for diagnosis of flat foot to evaluate cofactors such as age, weight, and gender and to estimate number of unnecessary treatments performed. They found that -boys had greater tendencies of flat foot then girls.

Lee MS, Vanore at al [10]. did a study entitled “Diagnosis and treatment of adult flatfoot.” This study was conducted on elementary school children in Taiwan to determine the prevalence of flexible flatfoot. A sample of 2,083 children, between 7 and 12 years of age was used.

They found that Males were twice as likely to have flatfoot as females. In present study all subject were divided into three groups according to age. Observations of the present study show that the incidence of flat foot is more in the age group 7-9 year in both the sexes (38%).

Conclusion

Correlation between radiological diagnosis and foot print methods was established. Study concluded that there is significant correlation between PI and TFM angle ($P < 0.05$).

Hence we can conclude that for diagnostic tool foot print method is as effective as radiological method.

References

1. Chen CH, Huang MH, The correlation between selected measurements from footprint and radiograph of flatfoot. *Arch phys med Rehabil.* 2006 Feb; 87 (2):235-40.
2. Chiu NT, Jou IM, Lee BF, et al. Symptomatic and asymptomatic accessory navicular bones: findings of Tc-99m MDP bone scintigraphy. *Clin Radiol* 2000; 55(5):353-355.
3. Davitt JS, MacWilliams BA, Armstrong PF. Plantar pressure and radiographic changes after distal calcaneal lengthening in children and adolescents. *J Pediatr Orthop* 2001; 21(1):70-75.
4. Eklem Hastalıkları ve Cerrahisi. Prevalence of flatfoot in Turkish male adolescents [Joint Diseases and Related Surgery Original Article 2009; 20 (2):90-92]
5. Ozcan Pehlivan et al Radiographic correlation of symptomatic and asymptomatic flexible flatfoot in young male adults [Int. Orthop. 2009 April; 33(2): 447–450.]
6. Tien TR, Parks BG, Guyton GP. Plantar pressures in the forefoot after lateral column lengthening: a cadaver study comparing the Evans osteotomy and calcaneocuboid fusion. *Foot Ankle Int* 2005; 26(7):520-525.
7. Valmassy RL. Torsional and frontal plane conditions of the lower extremity. In: Thomson P, Volpe R, eds. *Introduction to pod pediatrics.* 2nd Ed. New York: Churchill Livingstone; 2001:231-255.
8. Bordin D, Giorgi GD, Mazzocco G, Rigon F. Flat and cavus foot, indexes of obesity and overweight in a population of primary-school children. [*Pediatr.* 2001 Feb; 53 (1):7-13.]
9. Lee MS, Vanore JV, Thomas JL, Catanzariti AR, Kogler G, Kravitz SR, Miller SJ, Gassen SC. Diagnosis and treatment of adult flat foot *Journal of ankle surgery* 2005;44(2)78-113.
10. Martin Pfeiffer, MD, Rainer Kotz, Prof MD, Thomas Ledl, MSc, Gertrude Hauser, Prof MD, Maria Sluga, Prof MD Prevalence of Flat Foot in Preschool-Aged Children *Pediatrics.* August 1,2006; 118(2):634-639.