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Prevalence of flat foot deformity among the students of elite and slum schools of union territory of Chandigarh

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Abstract
Objective: The objective of the study was to assess the prevalence of flat foot deformity among the male students of elite and slum schools of the Union Territory of Chandigarh.
Material & Methods: A total of 600 hundred (N-600) schools students of Union Territory of Chandigarh consisted of three hundred (n-300) elite male students and three hundred (n-300) slum male students were selected for the study using non probability sampling technique namely purposive sampling. The age of the subjects ranged between 9 to 13 years. Pedograph was used to take print of the foot of the students and Clark's method of foot print angle was used to measure the angle of the subject's foot prints. Severity of foot deformity was ascertained through the procedure suggested by Forriol & Pascual.
Results: The result of the study showed that 12.5% school students of the Union Territory of Chandigarh suffered with the Flat Foot deformity. Severe flat foot deformity was reported 18.3% in the elite and 6.7% in slum schools students. The study revealed that the medial longitudinal arch of foot ($t= 7.86$, $p <.000$) of the slums were significantly higher to the elite schools students.

Keywords: flat foot, elite school, slum school, medial longitudinal arch

1. Introduction

In the process of man's evolution, changes in the use of the hands and feet began when original homo-sapiens adopted ground life as an upright biped position and the function of locomotion were gradually transferred from the arms and hands to the legs and feet [1]. The biped position with the consequent freeing of the front paws to be used in prehensile activities was a preliminary condition to the development of the brain and its mental processes. Upright posture not only brought about adaptation in the human skeleton, but also made necessary some major adjustment in the circulatory, digestive and nervous systems. The vertical positions for standing and bipedal locomotion are human characteristics and the human's alone. However, for this uniqueness a price is exacted. Vertical terrestrial biped position has made the human body not only more vulnerable to the forces of gravity in the maintaining the balance, but also to other possible weakness such as poor circulatory leading eventually heart failure, varicose veins, hernia, defective feet, back pain, sinus trouble, excessive curvature of the digestive and spine disorders [2].

There are various types of postural defects which may vary from mild to severe in degree. Some the defects affect the spine and others involve the lower extremities. The most common postural defects of the lower extremities are knock knees, bow legs and flat feet. In the lower extremities deformities flat foot is the common deformity among children. The human foot is complex, multi-joint system which determines the critical interaction between the lower limbs and the ground during locomotion. Human feet are very specialized structure. It is the base of the human body and supports all the body weight like a foundation. It is unique structure composed of bone supported by muscles with tendons and ligaments arranged in specialized form. The foot has three such arches, which are present at birth: the medial longitudinal, lateral longitudinal and the transverse arches. Of the three arches, the medial longitudinal arch is the largest and clinically the most important [3]. Infants are born with flat feet, and the longitudinal arch develops naturally during the first decade of life [4].

The occurrences of deformities especially in the children have been increased in the last few decades. It can drastically affect the efficiency of the students with postural deformities as compare to normal students. The postural deformities can be corrected to some extent, if diagnose at early stages. Therefore, this study had been designed to detect the postural deformities among the school students of the Union Territory of Chandigarh. The purpose of the study was to examine the lower postural deformity i.e. flat foot among the students of Elite and Government slum schools students of the Union Territory of Chandigarh.

2. Material and Methods

A Total of Six hundred (N-600) school's students included three hundred (n-300) elite students and three hundred (n-300) slum students were selected for the study using non probability sampling technique namely purposive sampling. The students were selected from three elite and three slum schools of Union Territory of Chandigarh. The age of the

subjects ranged between 9 to 13 years.

Fig 1: Illustration of Clark's method to measure the angle of foot print

The flat foot (Pes Planus) is one without a well formed medial longitudinal arch. The foot print was taken as the criterion for the detection of flat foot using Pedograph. The Clark's [5] method of foot print angle was used to measure the angle of the subject's foot prints (Figure 1). The procedures used in measuring flat foot including draw a line to represent the medial boarder of the foot between the points of the imprint at the base of the first metatarsal bone (base of the big toe) and calcaneous or heel bone. Locate the point where this line first touches the inner side of the imprint at the base of the first metatarsal bone. Then, with a ruler held on this point, swing it down from the toe until it just touches the edge of the point on the inside of the arch, and draw a line from the point across the print. No white paper should show between this line and the print. Measure the angle at the junction of the two lines with a protractor. Severity of deformity was ascertained through the procedure suggested by Forriol & Pascual [6]:

a) 0^{o} to 29.9^{o} - Flat foot (Severe flat foot)
b) 30^{o}- 34.9^{o} - Low arc foot (Moderate Flat Foot)
c) 35^{o}-41^{o} - Intermediary arc (Mild Flat Foot)
d) up to 42^{o} - Normal foot(Normal foot**)**

Statistical Analysis

Descriptive statistic and percentage was applied to analyze the data. The t-test was employed to find the difference among the students of elite and slum schools on flat foot with the help of SPSS software (SPSS version 16). The level of significance was set at 0.05.

3. Results

The aim of the study is to examine the prevalence flat foot among students of elite and slum schools of Union Territory of Chandigarh.

Table 1: Prevalence of Flat Foot deformity in Male Students of Elite and Slum Schools of Union Territory of Chandigarh

Groups	Elite		Slum		Total	
	F	%	F	%	F	%
Flat Foot (Fallen Arch) (below 29.9°)	55	18.3	20	6.7	75	12.5
(Moderate Flat Foot) (Low Arch Foot) (30°-34.9°)	22	7.3	3	1.0	25	4.2
Intermediary Arch (Mild Flat Foot) (35°-41°)	24	8.0	30	10.0	54	9
Normal Foot (above 42°)	199	66.3	247	82.3	446	74.3
Total	300	100	300	100	600	100

F= Frequency, % = Percentage

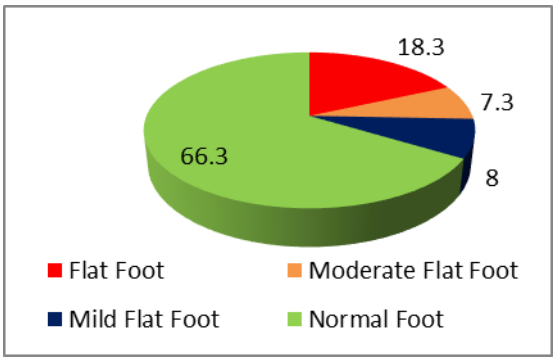

Fig 2: Prevalence of Flat Foot deformity in Male Students of Elite Schools of Union Territory of Chandigarh

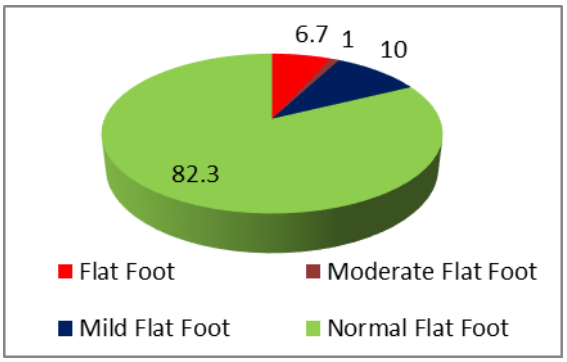

Fig 3: Prevalence of Flat Foot deformity in Male Students of Elite Schools of Union Territory of Chandigarh

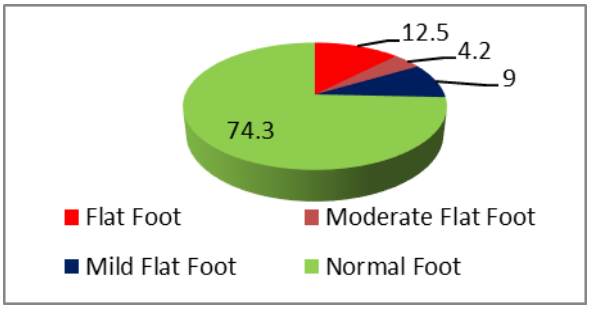

Fig 4: Prevalence of Flat Foot deformity in Male Students of Schools of Union Territory of Chandigarh

It is evident from the table no. 1 that between the two groups elite school had highest percentage of 18.3% students who were suffering with flat foot deformity as compare to slum school students (6.7%). Similarly highest percentages of students with low arch foot were also diagnosed in the elite school students with 7.3%, whereas in slum schools, it was reported in 1% students. In the slum schools 10% students had intermediary foot arch whereas in elite school it was detected in 8% students. The slum school had high percentage of students with normal foot (82.3%) as compared with elite schools where 66.3% students had normal foot arc. The result of the study also shows that in total, 12.5% of the students of the Union Territory of Chandigarh suffered with the severe foot deformity (flat foot) deformity, whereas 4.2% and 9% of the students had moderate (low arch foot) and mild (intermediary arch) foot deformities.

Table 2: Mean, Standard deviation and t-test of Flat Foot deformity of Male Students of Elite and Slum Schools of Union Territory of Chandigarh

Variable	Elite Schools	Slum Schools		
	Mean **(SD)**	Mean **(SD)**	**t-test**	**Sig**
Flat Foot (Medial Longitudinal Arc of Foot- in degree)	38.28 **(15.33)**	46.83 **(10.94)**	7.86	.000

df =598, Level of significance 0.05

The result of the study showed that there were significant differences in medial longitudinal arch of foot (t= 7.86, p <.000) of the elite and slum schools students. The results of the study showed that the medial longitudinal arch of foot of the slums students were significantly higher to elite schools students.

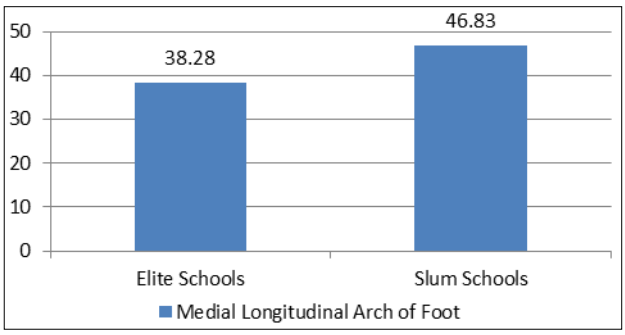

Fig 5: Mean of Medial Longitudinal Arc of Foot of Male Students of Elite and Slum Schools of Union Territory of Chandigarh

4. Discussion

The pre-pubertal phase and puberty are periods of life during which the posture undergoes many adjustments and adaptations due to physiological changes in the body and to demanding psychosocial factors. Between 7 and 12 years of age, a child's posture undergoes a big transformation to reach a compatible balance with the new corporal proportions [7]. Pires *et al.* [8] reports that improper postures adopted by children at home and school cause an imbalance in the body musculature, resulting in postural alterations, and they assert that vigilance by parents and teachers is very important for the timely correction of postural deviations so as to avoid permanent deformities. The result of study indicated that 12.5 percent student of the Union Territory of Chandigarh were suffering with the flat foot deformity and among these students, highest percentage of the students were from the elite schools as compare to slum schools. The mean value of medial longitudinal arch of foot of the elite schools students was also significantly lower than the slum schools students which indicated that students from the upper economic classes were more prone to the flat foot deformity. This might be attributed to the fact that students from the upper economy class enjoy affluent life style which was characterized by inadequate physical activity. This hypokinetic life style might be a precursor for the low medial longitudinal arch this is supported by Fabris de Souza *et al.* [9].

5. Conclusions

1. In total 12.5% male schools students of the Union Territory of Chandigarh were suffering with the flat foot deformity.
2. Severe flat foot deformity was observed in the 18.3% elite and 6.7% slum schools students.
3. The medial longitudinal arch of foot of slum school students was significantly higher to the elite school students.

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