

Prevalence and clinical impact of Adolescent Pes Planus among preparatory school males aged between 12-15 years.

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ABSTRACT

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Background:

The foot arch has an important role in the biomechanics of the foot to keep the foot more stable during standing and walking.

Foot arch distributes the weight over a wider area, increases speed and agility during walking, and provides a wider area that helps in stability and flexibility.

Aim:

providing statistical data about pes planus to increase awareness about pes planus and its medical management.

Patients & Methods:

Strategy for identification of studies: It is a descriptive cross-sectional study using a convenient sampling technique

Study population: According to data and statistics obtained from the Suez Directorate of Education, there are six preparatory schools in the Portawfik area.

The total population of males aged 12-15 years old is 503 students.

Inclusion Criteria:

1. Children in the age group of 12-15 years old.
2. Males
3. School children.

Exclusion Criteria: Children suffering from acquired pes planus are excluded.

Results:

In the study 76 students were diagnosed as pes planus, 75 were flexible pes planus and only one student was rigid pes planus. four students only were symptomatic and 71 were asymptomatic pes planus. The mean age of all students was 13.38 with a range from 12 to 15.

By Measuring the body mass index (BMI) among positive students 64 students (84.2%) were average BMI, 9 students (11.8%) were overweight and 3 students (3.9%) were underweight.

By Measuring the BMI among negative students 318 students (74.5%) were average BMI, 82 students (19.2%) were overweight and 27 students (6.3%) were underweight.

Regarding associated disease among positive students 73 students (96.1%) had no associated disease, 2 students (2.6%) had Asthma and only one student(1.3%) was diabetic.

Regarding associated symptoms among positive students, only one student (1.3%)was frequently changing shoes and preferred to walk barefooted, only one student (1.3%) was frequently changing shoes, only one student (1.3%) used to complain of pain during prolonged standing and only one student (1.3%) was preferring walk barefooted.

Conclusion:

schools are the right place to evaluate pes planus among Adolescence. The present study has quantified the prevalence and clinical impact of adolescent pes planus among preparatory school males aged between 12-15 years. Obesity could be a cause of symptomatic pes planus and decreasing the prevalence of pes planus can be possible by controlling the BMI and other factors..

Keywords: pes planus, medial longitudinal arch, plantar arch index.

INTRODUCTION

The foot arch has an important role in the biomechanics of the foot to keep the foot more stable during standing and walking.

Foot arch distributes the weight over a wider area,

increases speed and agility during walking, and provides a wider area that helps in stability and flexibility[1].

Based on the structure of the pedis arch, the shape of the sole of the human foot is divided into three categories normal foot, pes planus, and cavus foot

[2].

Pes planus is a state of flat arches in which all parts of the foot are attached to or almost stick to the ground. Pes planus normally exists in infants because the pedis arch is not yet fully developed[3].

As the child begins to stand, the longitudinal arches develop to help balance during standing and walking[4].

A study conducted in India in 2014 reported that 11.25% of the population aged 18-25 years have a bilateral flatfeet [5].

In Taiwan, a study reported that the prevalence of pes planus in children aged 6-12 years is 13.88%. In Indonesia, 24.14% of boys and 17.24% of girls aged 8-12 years developed pes planus[2].

Pes planus can be categorized into two types, flexible and rigid. Flexible pes planus is characterized by the disappearance of the arch while standing but appears while standing on toes.

[6].The Rigid pes planus is characterized by the disappearance of the arch while standing or standing on toes. [7].

Etiological factors of pes planus include overweight, type of footwear used by children, prolonged standing, congenital disorders, post-traumatic, genetic factors, neurological disorders, and collagen disease[8]. Flexible pes planus is rarely symptomatic in patients.

Early detection and early management are necessary in patients with pes planus to prevent more severe deformity at older age[9].

PATIENTS AND METHODS

The study was conducted at the Orthopedic Surgery Department, Faculty of Medicine, Suez Canal University as well as the Suez Directorate of Education Portawfik area in the Suez governorate. It was a Descriptive cross-sectional study using a convenient sampling technique.

A total of 503 male students between twelve and fifteen years old were included in the study as per the data and statistics obtained from the Suez Directorate of Education Portawfik area in the Suez governorate formed of six preparatory schools.

Any student suffering from any acquired pes planus was excluded.

Instrument/tool:

The most consistent footprint measurement is the plantar arch. The footprint is obtained by allowing children to stand on a glass plate inside a wooden box and photographing the footprint as shown in Figure 1.



Figure 1: child standing on a glass plate inside a wooden box.

The tool used to analyze data is the Plantar Arch index (PAI). StaheliLT developed the Plantar arch index, which is why it is also known as Staheli's arch index (SAI). It was used as a diagnostic tool for pes planus.

Procedure: After getting permission from the Directorate of Health and Population in Suez, the Suez Directorate of Education, and target schools, parental consent was obtained and we examined students. Every student was asked to stand on the glass and the foot comes in contact with the foot impression glass. Each student's foot impression was photographed in a standing posture.

Calculation of plantar arch index:

A line is drawn perpendicular to the medial forefoot edge and at the heel region. By calculating the mean point of this line, a perpendicular line is drawn crossing the footprint. The same procedure is repeated at the heel tangency[10].

Measurements are obtained by dividing the width of the central region of the foot (A) by the width of the heel region (B) in millimeters. The plantar arch index was (PAI = A/B). (Figure 2)

This index compares the width of the heel to the width of the middle of the foot while standing. A lower index value means a higher arch.

Footprint was obtained from school children by standing on a glass plate inside a wooden box and photographing the footprint as shown in Figure 3 and Figure 4:

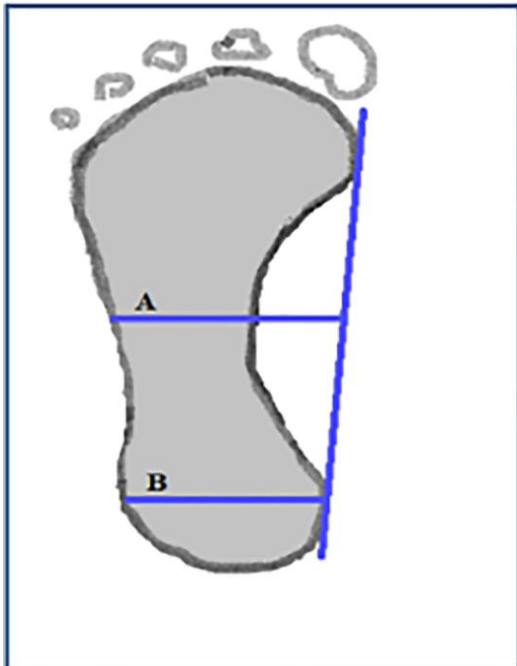


Figure 2: Schematic illustration of Staheli plantar arch index calculation. ‘A’ represents the width of the narrowest part of the midfoot, ‘B’ represents the width of the hindfoot.



Figure 3 Footprint of the normal foot arch.



Figure 4 footprint of pes planus.

Evaluation of plantar arch index:

The Plantar arch index of each student is compared with Normative Reference Values of PAI according to their age, which are as follows:

Table 1: Plantar arch index of each student compared with Normative Reference Values of PAI[11].

Age	Normative Reference Values Of PAI ¹⁰
11:	0.24---0.81
12:	0.34---0.9
13:	0.39---1
14:	0.35---0.83
15-16:	0.43---0.79

Ethical considerations:

- Both parents and students have been informed by the procdurer.
- Parenteral consent was taken after explaining to both parents and candidates the aim of the study and reassuring them that this study with no risk of any kind to them.
- The parents have the right to refuse participation without affecting the medical care expected to be offered to the patient.
- The patients have the right to withdraw from the study at any time.
- Procedure expenses were covered by the National Health Insurance Authority and state expenses.
- Confidentiality of all data of the study population preserved.

RESULTS

The study was conducted on five hundred and three students. Seventy-six students had pes planus. Only one of them suffered from rigid pes planus and the others were suffering from flexible pes planus.

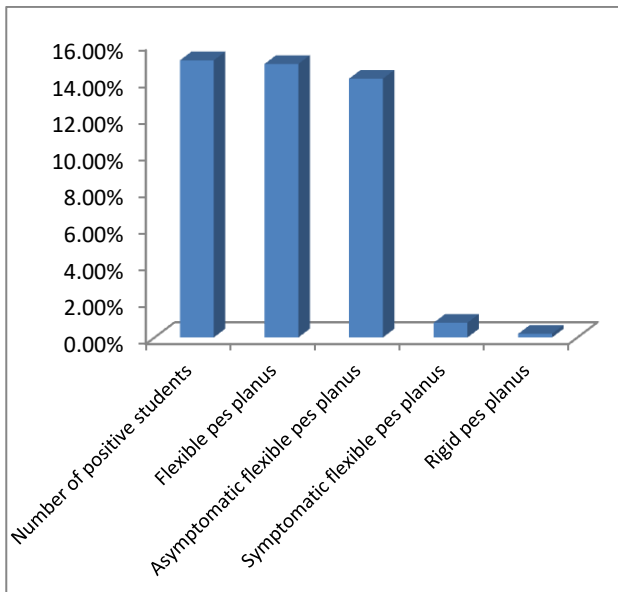
The results were shown in table 2 and graph 1: Among students who had pes planus, results show that 64 students (84.2%) were average BMI, 9 students (11.8%) were overweight and 3 students (3.9%) were underweight as shown in Table 3 and Graph 2:

Among negative students, results show that 318 students (74.5%) had average BMI, 82 students (19.2%) were overweight and 27 students (6.3%) were underweight as shown in Table 4.

Among positive students, results show that 73 students (96.1%) had no associated disease, 2 students (2.6%) had Asthma and only one student (1.3%) was diabetic as shown in Table 5 and Graph 3.

Table (2): general results of the study

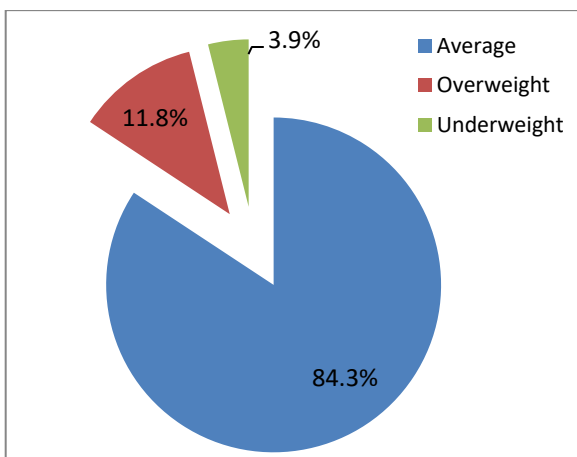
	No	%
Total number of students	503	100%
Number of positive students	76	15.1%
Rigid pes planus	1	0.2%
Flexible pes planus	75	14.9%
Symptomatic flexible pes planus	4	0.8%
Asymptomatic flexible pes planus	71	14.1%



Graph 1: general results of the study

Table (3): BMI among positive students

	No	%
Body mass index	Average	64 84.2%
	Overweight	9 11.8%
	Underweight	3 3.9%
Total	76	100%



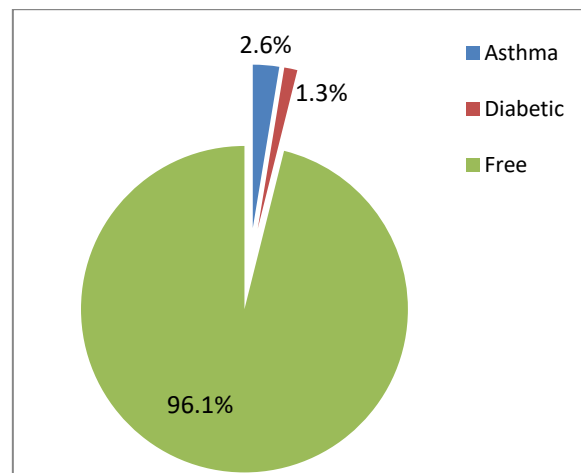
Graph 2: BMI among positive student

Table (4): BMI among negative students

	No	%
Body mass index	Average	318 74.5%
	Overweight	82 19.2%
	Underweight	27 6.3%
Total	427	100%

Table (5): Associated diseases among positive students

	No	%
Associated disease	Asthma	2 2.6%
	Diabetic	1 1.3%
	Free	73 96.1%



Graph 3: Associated disease among positive students

Among positive students, results show only one student (1.3%) was frequently changing shoes and preferred to walk barefooted, only one student (1.3%) was frequently changing shoes, only one student (1.3%) used to complain of pain during prolonged standing and only one student (1.3%) was preferring walk barefooted as shown in table 6.

Table (6): Associated symptoms among positive students

	No	%
Associated symptoms	No	72 94.7%
	Frequent change of shoes and Preferring to walk barefooted	1 1.3%
	Frequent change of shoes	1 1.3%
	Pain during prolonged standing	1 1.3%
	Preferring to walk barefooted	1 1.3%

There was a statistically significance increase in associated symptoms in overweight students as shown in Table 7.

Table (7): Comparison between BMI among associated symptoms of students

		Body mass index				Chi-square test	
		Average		Overweight		X ²	P value
		No	%	No	%		
Associated symptoms	Frequent change of shoes	0	0.0%	1	11.1%	23.37	0.003
	Frequent change of shoes and prefer walking barefoot	0	0.0%	1	11.1%		
	Pain during prolonged standing	0	0.0%	1	11.1%		
	Prefer walking barefoot	1	1.6%	0	0.0%		

DISCUSSION

The total population of males in our study aged 12-15 years old was 503 students..76 students were positive pes planus, 75 were flexible pes planus and only one student was rigid pes planus,4 students only were symptomatic and 71 were asymptomatic pes planus. The age of all students was 13.38 with a range from 12 to 15 years. The estimated prevalence of pes planus of children aged 11–15 in our study is almost consistent with studies conducted in Iran (17.1, 16.1%), Colombia (15.7%), Islamabad, Pakistan (14.8%), and Sri Lanka (16.06%) [12][13]. It is hard to explain the reason for the similarity of estimations since these studies used different outcome methods and younger samples with different stature, but factors like the proportion of normal BMI, footwear, and physical activity are similar to the study population. In contrast, the reported prevalence is lower than the findings that have been reported in higher socio-economic regions, Saudi Arabia (29.5%), Taiwan (59%), Poland (36%), Vienna, Austria (44%) and Nigeria (27.4%). [14][15].

CONCLUSION

Schools are the right place to evaluate pes planus among Adolescents. The present study has quantified the prevalence and clinical impact of adolescent pes planus among preparatory school males aged between 12-15 years. Obesity could be a cause of symptomatic pes planus and decreasing the prevalence of pes planus can be possible by controlling the BMI and other factors. The information obtained by this study will be useful in the field of orthopedics.

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