

PREVALENCE OF LOWER LIMB POSTURAL DEFORMITIES AMONG MALE SCHOOL STUDENTS OF UPPER AND LOWER SOCIO-ECONOMIC CLASSES

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Abstract

The aim of the study was to assess the prevalence of lower limb postural deformities among male school students of upper and lower socio-economic classes in the Union Territory of Chandigarh. By using a convenient sampling technique, 949 male school students were selected from six government and three non-government schools of the Union Territory of Chandigarh. The student's age ranged between 13 and 17 years and was categorised into two categories, i.e., upper and lower socio-economic classes, with the help of the Socio-economic Status Scale (SESS). The selected variables such as age, height, weight, BMI, flat foot (medial longitudinal arch), knock knee (intermalleolar distance) and bowlegs (intercondylar distance) were measured with standardised tests and tools. Descriptive statistics and student's t-test were employed to analyse the data. The study revealed that 24.76%, 20.13 %, and 7.69% of male school students in Chandigarh suffered from flat foot, knock knee and bowleg deformities, respectively. Flatfoot and knock knee deformities were more prevalent among the male school students of upper socio-economic class. In contrast, bowlegs were common in male school students of lower socio-economic class. The male school students of upper socio-economic class had superior height, body weight and body mass index as compared to lower socio-economic class.

Keywords: Lower limb, flat foot, knock knees, bow legs, male students, socio-economic classes

Introduction

The body's posture is essential for the optimal functioning of the human physique. Establishing a foundation of correct postural habits during the early stage of childhood not only fosters appropriate growth and maturation but also yields enduring favourable impacts on overall well-being and quality of life in the future (Gao et al., 2018). Good posture is a state of equilibrium of muscles and skeleton that protects the body's supporting structures from damage or deformation in any state of rest or work. Bad posture is a relation of body parts that causes increasing effort on the supporting structures, wherein there is less efficient body-base equilibrium. (Metheny, 1952).

Posture is an integral part of everyday life (Tahirbegolli et al., 2021). Correct body posture in a child significantly promotes the overall growth of their body. For instance, it contributes to the normal growth and functioning of body organs, enhances the effectiveness of motor activity, and promotes general well-being. Posture is not a matter of static position but of efficient actions; how it works is more important than how it looks. (Morrison, W. R., Chenoweth, L.B (1941). Posture is a state that enables the body to function to the best advantage in terms of work done, health, and appearance (Ferguson et al., 2019). Today's sedentary lifestyle, where children sit in school for long hours followed by additional hours in front of screens, poses a considerable risk to overall health. (Tahirbegolli et al, 2021)

Poor posture puts more work on muscles, ligaments, and abnormal bone strains and may eventually produce deformities. It interferes with respiration, heart action, and digestion and detracts from feelings of self-confidence (Anthony & Kolthoff, 1975). The lower limb deformities commonly prevail among children are flat feet, knock knees and bowlegs.

Although the exact incidence of flat feet in children is unknown, it is widespread and is one of the most common conditions seen in paediatric orthopaedic practices. Every child is born with flat feet, and more than 30% have a calcaneovalgus deformity of both feet. (Mortzavai et al., 2007). Flat foot (overpronated) is a condition of the foot that consists of an absent or abnormally low longitudinal arch. (Bresnahan, 2006)

Bow legs, also known as genu varum, are a condition where the knees bow outwards from the midline due to a joint deformity in the legs. It is a normal physiological process in walking children under the age of 2 years. (Cheema et al., 2003). The knock knee is one of the deviations affecting children and young adults. Knock knees are medically called genu valgum or valgus. Valgus denotes a malalignment in the frontal (coronal) plane in which the part distal to the site of deformity deviates away from the midline.

There are many studies available in the literature that were conducted on the prevalence of postural deformities in school-going children. For instance, Peter et al. (2020) conducted a cross-sectional study in Urhobo, Delta State, Southern Nigeria, to assess the occurrence of genu varum in children aged 6-10 years and found that 4.3% of children had postural deformities. Similarly, Ganeb et al. (2021) reported that 0.09% of students in primary schools in Egypt had bow leg deformities. Shahpuri et al. (2019) also conducted a study in Qom province, Iran, to assess lower extremity postural disorders among 6 to 7-year-old school children, and the result showed that 17.7%, 24.2% and 13.38% of students were suffering from knock knee, bow legs and flat foot deformity respectively. However, there is a need for more studies where postural deformities were assessed among students of different socio-economic classes. Along with other factors, socio-economic status is essential to the child's postural health. Therefore, the current study has been designed to assess lower limb postural deformities among male school students belonging to the upper and lower socio-economic classes.

Method and procedure

A survey-type study was designed to assess the lower limb deformities among male school students belonging to upper and lower socio-economic classes. A convenient sampling technique was used to select schools and students. Six government and three non-government schools of the Union Territory of Chandigarh, India, were selected. Nine hundred forty-nine (N=949) male school students were selected from government and non-government schools to collect the required data on the selected variables. The ages of subjects ranged from 13 to 17 years. Further, the subjects were subdivided into two categories i.e. upper and lower socio-economic classes, based on their economic status, possession of goods and services, health, and educational parameters using the Socio-economic Status Scale (SESS) developed by Kalia and Sahu (2012).

Age: The subjects' age was determined from the school records. The age was calculated in years.

Height: The vertical distance from the lowest point to the highest point of an individual's body in an erect anatomical position was recorded with the help of a stadiometer (prestige) to the nearest centimetres.

Weight: Body weight, expressed in kilograms, was recorded on a standard Spring Weighing Scale to the nearest 500 milligrams.

Body Mass Index: The students' BMI was calculated using the standardised formula = $\text{Weight}(\text{kg}) / \text{Height}^2 (\text{m})$.

Flat Foot: The pedograph method was used to take print of the medial longitudinal arch of the foot, and the Clark method of footprint angle was employed to measure the angle of the subjects' footprints in degrees. The angle of the medial longitudinal arch of the foot between 0° to 29.9° is considered a flat foot (Forriol & Pascual, 1990).

Knock Knee (Intermalleolar Distance): A sliding calliper (seritex) was used to measure the intermalleolar distance of the foot to the nearest centimetre. The intermalleolar (IM) distance of more than 9 cm, measured between the medial malleoli with the medial condyles touching, is marked as a knock knee (Lin et al., 1999).

Bow Legs (Intercondylar Distance): A sliding calliper (Seritex) was used to measure the knees' intercondylar distance to the nearest centimetre. The intercondylar (IC) distance, determined by the proximity of the medial condyles with the medial malleoli touching, indicates bow legs. Bowlegs are identified when the IC distance exceeds 5 cm at any age (Sharrard, 1976).

Statistical analysis

Descriptive statistics such as percentage, mean, and standard deviation were used to analyse data. Further, a student t-test was employed to compare the male school students of upper and lower socio-economic classes using SPSS software (SPSS version 21). The level of significance was set at 0.05.

Results

Table 1. Prevalence of Flat Foot deformity in male students of upper and lower socio-economic classes

Groups	Upper Socio-Economic Class		Lower Socio-Economic Class		Total	
	F	%	F	%	F	%
Flat Foot (below 29.9°)	124	29.38	111	21.92	235	24.76
Normal Foot (30° above)	297	70.62	417	78.08	714	75.24
Total	421	100	528	100	949	100

Table 1 presents data on the prevalence of flat foot deformity among male students from different socio-economic classes in schools across the Union Territory of Chandigarh. The data shows that 24.76% of students in the region suffered from flat foot deformity, while 75.24% had normal foot structure. The upper socio-economic class had a high percentage of students with flat foot deformity (29.38%) compared to the lower socio-economic class (21.92%).

Table 2. Prevalence of knock knee deformity in male students of upper and lower socio-economic classes

Groups	Upper Socio-economic Class		Lower Socio-economic Class		Total	
	F	%	F	%	F	%
Knock knee (above 9cm)	130	30.80	61	11.55	191	20.13
Normal leg (below 9 cm)	291	69.20	467	88.45	758	79.87
Total	421	100.0	528	100.0	949	100

Table 2 depicts the prevalence of knock knee deformity among male students of upper and lower socio-economic classes. The results show that 20.13 % of male school students of the Union Territory of Chandigarh suffered from Knock Knee deformity. The data also show that knock knee deformity (30.80 %) in the students of upper socio-economic class was higher than that of students of lower socio-economic class (11.55%).

Table 3. Percentage of bowleg deformity among the male students of upper and lower socio-economic classes

Groups	Upper Socio-economic Class		Lower Socio-economic Class		Total	
	F	%	F	%	F	%
Bow leg (above 5cm)	17	4.02	56	10.6	73	7.69
Normal leg (below 5cm)	404	95.98	472	89.4	876	92.30
Total	421	100.0	528	100.0	949	100

Table 3 presents the bow leg deformity among male students from upper and lower socio-economic classes in the Union Territory of Chandigarh. The study found that 7.69% of the students in the Union Territory of Chandigarh had bow leg deformity, while 92.30% had normal legs. The students belonging to the lower socio-economic class had the highest percentage of bow leg deformity (10.6%) compared to the students of the upper socio-economic class (4.02%).

Table 4. Comparison of age, height, weight, BMI and lower limb deformities (flat foot, knock knee and bow leg) among the male school students in upper and lower socio-economic classes

Groups Variables	Upper Socio-economic Class	Lower Socio-economic Class	t-test	Sig
	Mean ± SD	Mean ± SD		
Age (years)	14.54 ± 1.37	13.83 ± 1.13	8.68	.000
Height (cm)	160.95± 9.93	149.48 ± 12.20	15.60	.000
Weight (kg)	61.26 ± 17.32	40.27 ± 12.09	21.95	.000
BMI (kg/m ²)	23.46 ± 5.54	17.70 ± 3.66	19.19	.000
Flat foot (medial longitudinal arc)	33.60 ± 15.21	34.92 ± 11.65	1.50	.133
Knock knee (Intermalleolar Distance)	5.70 ± 3.96	3.84 ± 3.43	7.72	.000
Bow leg (Intercondylar Distance)	0.44 ± 1.58	1.23 ± 2.44	5.74	.000

Table 4 shows that the mean, standard deviation and t-test values on the variable of age, height, weight, BMI, flat foot (medial longitudinal arc), knock knee (intermalleolar distance) and bowlegs (intercondylar distance) among the male school students of upper and lower

socio-economic classes. The study's results illustrate that the mean value of age, height, weight, BMI and intermalleolar distance was significantly higher among the male students of upper socio-economic classes than the male students of lower socio-economic classes. Meanwhile, male students of lower socio-economic classes had significantly higher medial longitudinal arc and intercondylar distance values than male students of upper socio-economic classes.

Figure 1. Mean comparison of age, height, weight, and BMI among the male school students in upper and lower socio-economic classes

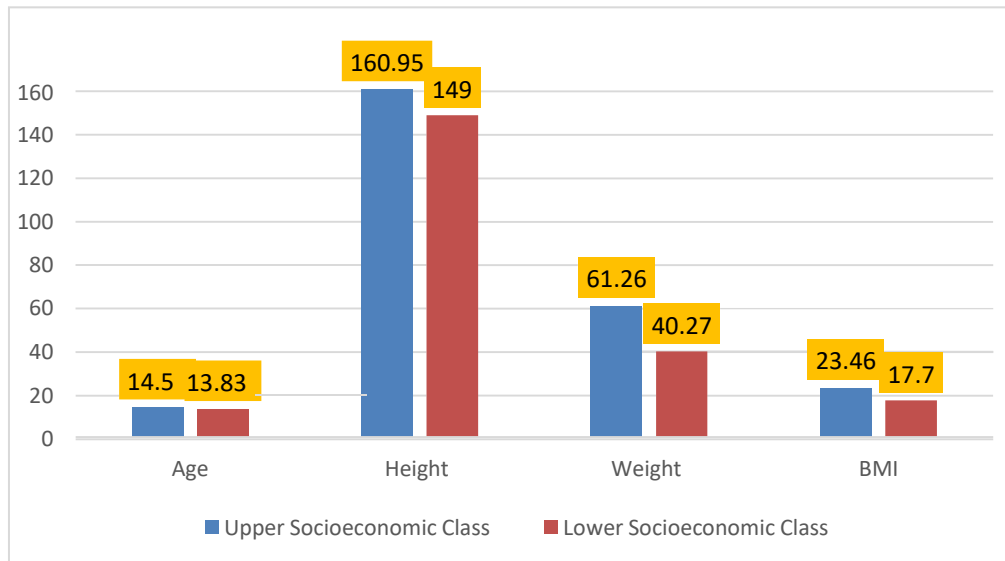
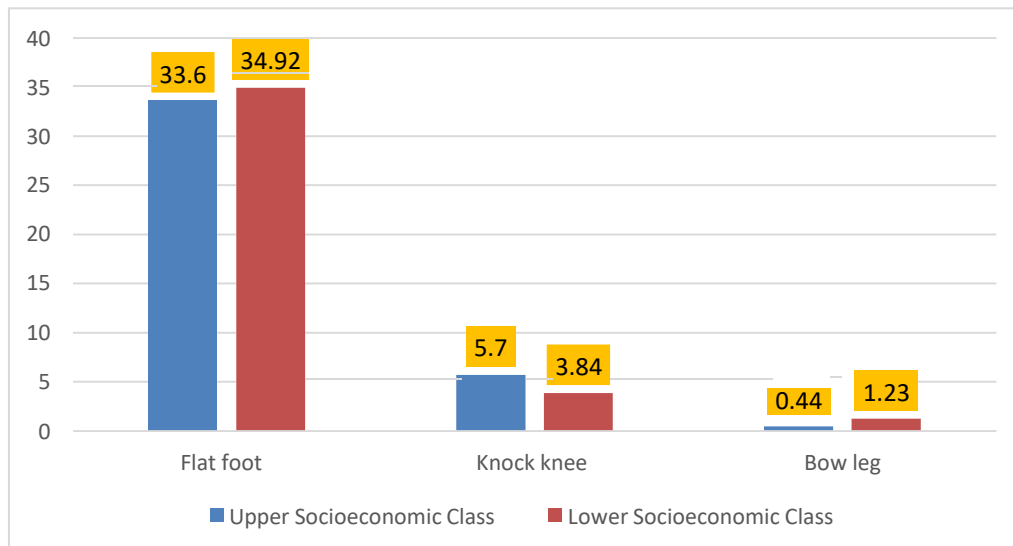


Figure 2. Mean comparison of lower limb deformities (flat foot, knock knee and bow leg) among the male school students of upper and lower socio-economic classes.



Discussion

The study aimed to assess and compare lower limb postural deformities in male school students of upper and lower socioeconomic classes. The result of the study revealed that 24.76% of students in Chandigarh had flat foot deformities, which is more prevalent among

male school students from upper socioeconomic classes. Pourghasem et al. (2016) conducted a study to assess the prevalence of flatfoot deformity among school students belonging to Babol city of Iran. The result of the study reveals that 16.1% of students had flat foot deformities. Similarly, Ezema et al. (2014) reported flat foot deformities among the 22.4 % of school students studying in primary school in Enugu, Nigeria. Raj et al. (2022) conducted a study on the prevalence of flat foot deformity among adolescents residing in Bangalore, India. The result of the study shows that 32.8% of adolescents suffered from flat foot deformity.

The result of the present study shows that 20.13% of the male school students had knock knee deformity. Again, it is highest among students of the upper socioeconomic class as compared to lower socio-economic class. Mahmoud et al. (2005) reported knock knee deformity in 2% of primary school students in Kerman, Iran. Similarly, 7.1% of elementary school students in Santos, Brazil, had knock knee deformity (Ciaccia et al., 2017). Shahpuri et al. (2019) also reported knock knee deformity in 17.7% of school students in the Qom province of Iran. The high percentage of flat foot and knock knee deformities in the upper socioeconomic class compared to lower socioeconomic class students may be attributed to high body mass index. Many studies in the literature associate flat feet and knock knee deformity with body mass index (Ezema et al., 2014; Pourghasem et al., 2016; Soheilipour et al., 2020; Walker et al., 2019).

It is evident from the present study that bowlegs were reported in 7.69% of male school students in Chandigarh. The prevalence of bowleg deformity was higher in male school students of lower socioeconomic class than their counterparts. The result of the study was in line with the previous studies. Shahpuri et al. (2019) reported bowleg deformity in 24.2% of school children aged 6 to 7 years old in Qom province, Iran. Patil et al. (2021) reported bowleg deformity among 6.7 % of students in the Dhule District of Maharashtra. Similarly, Ghandi et al. (2021) reported the prevalence of bowleg deformity among 2.53% of students in primary school, 6.98% of students in junior high school, and 16.33% of students in senior high school in Arak City, Iran. Bow leg deformity was inversely related to BMI (Soheilipour et al., 2020). The present study also reported lower BMI among school students of lower socioeconomic classes. Therefore, bowleg deformity was more prevalent in school students of lower socioeconomic classes.

The present study further compared the mean value of the age, height, weight, BMI, flat foot (medial longitudinal arc), knock knee (intermalleolar distance) and bowlegs (intercondylar distance). The results show that the height, weight and BMI were significantly higher among the upper economic classes. Luhar et al. 2018 also report a high percentage of overweight and obesity among the upper socioeconomic classes in India. The superior height among the upper economic classes may be attributed to a better diet, hygiene and health services. On the other side, junk food and high-caloric diets are also popular among the upper socioeconomic classes that account for the high burden of overweight and obesity. The current study also reports a higher mean value of knock knee (intermalleolar distance) among upper socioeconomic classes. It may be associated with high BMI among upper socioeconomic

classes (Soheilipour et al., 2020; Walker et al., 2019). In contrast, the bow leg is inversely associated with BMI (Soheilipour et al., 2020). Therefore, a significantly higher mean value was reported in intercondyler distance among the lower socioeconomic classes.

Conclusion

From the results of the present study, it can be concluded that flatfoot and knock knee deformities were more prevalent among male school students of upper socioeconomic classes, whereas bowlegs were common among male school students of lower socioeconomic classes. The male school students of upper socio-economic class also had superior height, body weight and body mass index as compared to lower socio-economic class.

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