The Incidence Of Pes Planus Amongst Akwa Ibom State Students In The University Of Calabar

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Abstract

The prevalence of pes planus was determined among the people of Akwa Ibom State of Southern Nigeria. From the University of Calabar Community, a total of 1000 students comprising of 500 males and 500 females of Akwa Ibom State origin and aged 20-30 years were used for the study. All volunteers had no deformities or previous fractures of the lower extremities especially of the foot. The dynamic footprints of the students were obtained using endorsing ink and plain duplicating paper. The contact index II was determined as the ratio of the contact width to the total width of the foot print. Descriptive statistics for each variable included mean and standard deviation (SD). Mean±1-2SD was regarded as normal but greater than this was considered abnormal (flat foot). A total of 67 individuals had flat foot comprising of 29 males and 38 females. The overall prevalence of pes planus was 13.4% with a prevalence of 5.8% among males and 7.6% among females. Bilateral flat foot was commoner among females (6.2%) than males (5.0%). Unilateral flat foot was also commoner among females (1.4%) compared to males (0.8%). Our results showed that the prevalence of pes planus was higher among females than males in Akwa Ibom state of Nigeria.

INTRODUCTION

Many studies have been conducted on foot and footprints in the disciplines of Anatomy, anthropology, forensic science, orthopedics, ergonomics etc. Pes planus is a condition in which there is loss of the longitudinal arch of the foot. Its alternative names are flat foot, pes planovalgus, fallen arches and foot pronation [12] . The flexible type of pes planus is relatively common and is due to soft tissue abnormalities. Rigid pes planus is caused by a combination of bony or fibrocartilaginous and soft tissue abnormalities, and include tarsal coalition [34] , congenital vertical talus [5] , idiopathic tight heel cord, neuromuscular disorders (e. g. cerebral palsy and polio) [6] , tarsal fracture with secondary osteoarthritis and rheumatoid arthritis. Tarsal condition is the commonest type f rigid foot

Most children are born with flat foot especially of the flexible type, but as they start to walk, they develop normal arches within the feet in the first decade of life [78] . Only if the deformity persists or presents in adolescence or adulthood is it considered abnormal. [8] demonstrated a higher prevalence of flat feet among children who wore shoes compared with those who were unshod [9] . The authors observed that closed-toe shoes inhibited the development of the arch of the foot more than slippers or sandals. Long term studies indicate that flexible flat foot in children and adults is a physiological variant and like any other variant may occasionally cause disability. While the presence of flat foot is not known to prevent successful athletic competition per se there is an associated increase in the tendency of injury to occur [10] .

Reviews on several aspects of flat foot abound in the literature [1112] . Careful examination of foot impressions and utility of individualizing characteristics of footprints such as various features of the toes, humps in the toe line, phalange marks, flatfoot condition, pits, cracks, corns, etc in forensic examination can provide useful clues to establish personal identity whenever complete or partial footprints are recovered at the crime scene and can help in including or excluding the possible presence of individual at the scene of crime [13] . Analysis of bare footprints is often carried out in developing countries like India where the foot prints are frequently recovered at the crime scene [14] . Analysis of footprints can reveal very important clues which can be used as forensic evidence in crime scene investigation. Apart from giving idea about the bare foot morphology and individualistic characteristics, the footprints are also indicative of the body size of the person [15] .

In forensic investigation difficulties are being experienced in

the stature and gender estimation of bodies dismembered in mass destruction. This difficulties can be eliminated by developing a formulae for estimation of the stature and gender through foot measurement. The research carried out by [16] on the stature and gender estimation using foot measurement taken from the 249 subject who were attending Medical Faculty of Dokuz Eylul University and School of Physical Therapy and rehabilitation in Turkey showed that in males, the stature and foot measurement was higher than in females, and the difference between the average measurement was significant. The dimensions of the foot have been used for the determination of sex, age, and stature of an individual. [17] reported that the correlation coefficients between stature and foot dimensions were found to be positive and statistically significant among Gujjars, a North Indian endogamous group. Thus in forensic anthropology, estimation of stature from feet dimensions plays a significant role in establishing personal identity [18] .

In medico-autopsies, establishing personal identity of the victims is often required. Estimation of stature from extremities and their parts play an important role in identifying the dead in forensic examinations. The study carried out by [19] examines the relationship between stature and dimensions of hands and feet among Rajputs of Himachal Pradesh – a North Indian endogamous group. The correlation coefficients between stature and all measurements of hand and feet were found to be positive and statistically significant. The highest correlation coefficients between stature and foot length and lowest SEE (standard error of estimate) indicate that the foot length provides highest reliability and accuracy in estimating stature of an unknown individual. The importance of this present study is to provide data on flat foot among the people of Akwa Ibom for more accurate comparison to other peoples of the world.

MATERIALS AND METHODS

A total of 1000 individuals of Akwa Ibom State origin with a median age between 20-30 years, drawn from the University of Calabar Community where the research was carried out, volunteered for the study. The study population consisted of 500 males and 500 females. Research Ethics Committee guidelines relating to the use of human subjects for research purposes were duly followed. All the volunteers had no deformities of the lower limb or history of fractures of the foot. For each volunteer, dynamic footprints were obtained using endorsing ink and plain duplicating paper [20] . The outline of the foot was drawn with a lead pencil and the

following measurements taken using a planimeter as shown in figure1:

Figure 1

Figure 1: Foot measurements.

The midpoint of the posterior margin of the heel, X, and the most distal points of the big toe, Z, and second toe, Y, were marked on the outline of the foot print and two lines, XZ and XY. Two transverse lines, CD and GH, are drawn at right angles to XZ to divide the footprint into anterior 3/10, posterior 3/10 and middle 4/10. An additional transverse line, EF, was drawn across XY dividing the foot into two equal halves.

On the medial border of the foot, the innermost points of the heads of the 1 [st] metatarsal and the heel were connected by an anteroposterior line, DJ. Similarly, the outermost point of the head of the 5 [th] metatarsal and the heel were connected, CK. Contact index II was calculated as the contact width of the midfoot to the total width of the foot print [21] . Descriptive statistics for each variable included mean and standard deviation (SD). Mean±1-2SD was regarded as normal but greater than this was considered abnormal (flat foot).

RESULTS

Figure 2

Table 1: Mean and SD of arch indices in the subjects

Sex	No. of subjects	Mean arch index	
		Right	Left
Male	500	0.52±0.172	0.52±0.170
Female	500	0.49±0.153	0.49±0.161

*peak values for normal feet were 0.69 for males and 0.65 for females; peak values for flat feet were 1.03 for males and 0.96 for females.

Figure 3

Table 2: prevalence of bilateral flat foot

	Male	Female	Total
Normal feet	475	469	944
Flat feet	25	31	56
Total	500	500	1000
% prevalence	5.0	6.2	11.2

Figure 4

Table 3: prevalence of unilateral flat foot

	Male	Female	Total
Normal feet	496	493	989
Flat feet	4	7	11
Total	500	500	1000
% prevalence	0.8	1.4	2.2

DISCUSSION

Table 1 shows the mean arch indices in males and females. The mean contact index in the male subjects was 0.52±171 and that in the female subjects was 0.49±0.157. According to [22] , arch indices could range from 0.0-1.0 and are indicative of cavus and planus foot respectively. Table 2 shows the prevalence of bilateral flat foot within the study population. A prevalence of 5.0% among males, 6.2% among females and a total of 11.2% within the study population was observed. This higher prevalence among females may be due to the fact that females tend to have small bones and less bulky muscles. Since both factors help in the maintenance of the arches of the foot [23] , females are, therefore, more prone to developing pes planus. Table 3 shows the prevalence of unilateral flat foot within the study population. A prevalence of 0.8% among males, 1.4% among females and total of 2.2% was observed.

Works on several aspects of flat foot abound in the literature. [24] investigated the prevalence of flat foot among school children in Port Harcourt, Nigeria. In that study, unilateral pes planus was more prevalent (2.22%) than bilateral pes planus (0.6%) and this was attributed to the early introduction of the use of shoes. [25] further investigated the incidence of flat foot among athletes in Port Harcourt, Nigeria and reported an incidence of 7.5% bilateral flat foot and 3.5% unilateral flat foot among the athletes. Elsewhere in Africa, [1112] reported considerably higher values among students of Mbarara University of Science and Technology, Uganda.

Statistical analysis on the estimation of stature from dimensions of hands and feet in a North Indian population indicates that the bilateral variation was insignificant for all measurements except hand breadth in both sexes (P< 0.01). Sex differences were found to be highly significant for all the measurements (P< 0.01) [18] . The relationship between stature and feet dimensions among Rajbanshi male and female individuals of North Bengal, India was studied. The results indicate that female Rajbanshi individuals exhibit shorter stature and smaller feet than their male counter part [17] . In the study, individualizing characteristics of footprints in Gujjars of North India-forensic aspects, flatfoot condition is found to be present in 1.54% of the sample population and the trait also shows bilateral variations [13] .

CONCLUSION

This study, therefore, has provided the prevalence of pes planus among the youth of Akwa Ibom for comparison to other tribes and regions of the world.

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