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# Flat-foot in overweight is an escalating health problem among college going students

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ABSTRACT

Flat-foot is a remedial condition, where the foot does not have a normal longitudinal health arch while standing. The study aims at assessing and associating flat-foot levels among college students. The study design adopted with a simple sampling technique was an exploratory survey design that selected 102 students. Inclusion requirements include age: 18 to 24, both genders. Body mass index 25.0 and bilateral/unilateral flat-foot index. The resource consists of a structured questionnaire in Section A. The goal of section B was to use the Denis method to test the flat foot. The majority of college students who are overweight belong to the Grade 1 category. In the age-wise category, between 17 years and 20 years, 18 of them were flat-foot in Grade 1, 11 were flat-foot in Grade 2, and 4 were in Grade 3, for a flat toe. In Grade 2, 14 males were flat-foot, and in Grade 1, 21 females were flat-foot about gender. Students ranged in height from 1.40 m to 1.53 m, 16 of whom were flat-foot grade 1 and students under 76 to 100 kg were flat-foot grade 1, and their BMI ranged from 25 to 34, 22 of whom were flat-foot grade 1. The current study indicates a clear correlation between flat foot levels with their demographic weight variable at 0.00 and with their BMI at 0.026. A significant association between demographic variables and their footprint is therefore present.

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## INTRODUCTION

Obesity is a global issue that needs to be addressed appropriately. According to WHO, around 250 million people worldwide suffer from obesity. Feet, the body's support centre, consists of multiple bones grouped by and connected by muscles and ligaments. The foot has three arches, which are known as the medial longitudinal arch, the lateral longitudinal arch and the transverse arch. [1]

Flat-foot is a remedial disorder in which the foot, when standing, ensures not have a typical therapeutic longitudinal arch [2, 3]. The actual occurrence of flat-foot is unclear, mainly because the strict clinical or radiographic requirements for identifying a flat-foot are not consensually accepted. At the root of this problem lies the absence of a widely agreed definition of a "natural," as opposed to a longitudinal arch of "average height." A flat-foot has historically been individually described as a weight-bearing foot with an unusually low or lacking longitudinal arch. [4]

It has been documented that when children first start to stand, flat feet are normal because they seem to spread out in a wide position as they attempt to maintain stability and reach for support with the feet, and the soles turn outward. [5]. When they

are 12 or 13 years old, the feet of most children who showed the condition as infants become structurally regular. Several changed issues can lead to the growth of flat pedes. These include large, the types of shoes a child wears, sitting or sleeping positions of a child, return for other anomalies that continue up the leg, or more severe factors.

Frequent extreme loading, however, can elasticity muscles beyond their elastic limits, damage soft tissues and increase the risk of foot pain and subsequent development of foot diseases. [6] There are several different factors which can subsidise to flat ends growth. These include overweight, the types of shoes a child wears, sitting or sleeping positions of a child, compensation for other anomalies further up the leg, or more serious causes such as ligament rupture or tendon rupture throughout the foot. Repetitive undue loading, however, can extend the ligaments beyond their elastic limit, damage soft materials and increase the risk of foot pain and subsequent development of foot diseases. [5].

Pourghasem et al. (2016) [7] conducted a study on this cross-sectional descriptive analysis, the incidence of flat-foot between institute pupils and its association with BMI included a total of 1158 school children (653 male and 505 female). In using the Dennis system, flat-foot diagnosis and severity were assessed. Infant BMI was measured as body weight divided by squared height (kg*m−2).

The majority of respondents (83.9 per cent) had regular feet. The flat-foot frequency was 16.1 per cent, with a declining age rate. Boys had a higher flat-foot frequency than females, but the difference was not important ($p > 0.05$). Flat-foot prevalence was 17.5 per cent for boys and 14.5 per cent for girls. The number of children overweight and obese was 10.3%. There was a substantial variance in the flat-foot occurrence among underweight (13.9%), average weight (16.1%), overweight (26.9%), and large (30.8%); adolescents.

Increased foot pain is postulated to serve as a deterrent for obese individuals to participate in physical activity and, in turn, to improve the obesity cycle, as feet are our basis for support in most weight-bearing activities. Because of this, impaired foot structure and foot pain associated with obesity are considered a significant concern for children's health. However, whether such harmful effects associated with childhood obesity exist in the elderly foot has not been extensively studied. The aim of this education was therefore to limit the properties of obesity on the building and purpose of the foot, and the foot pain practised by college students.

## MATERIALS AND METHODS

The research at SRM Health Sciences was conducted. An exploratory survey design was the research design adopted for this report. The easy sampling technique picked 102 students. Criteria for inclusion include age: 18-24 years, all genders. Body mass index 25.0 and flat-foot bilateral/unilateral. Students with Bony Lower limb Anatomy, Ligament damage of the ankle and foot, Degenerative or Rheumatoid arthritis, History of the ankle or foot fracture, Club foot and Congenital flat-foot, Hallux valgus, were exclusion criteria. Two parts composed of the instrument. To test the demographic variables, Section A consisted of a standardised questionnaire. Figure 1 represents that the object of section B was to evaluate the flat foot by using Denis method. Scoring Interpretation as Normal – lateral edge of the foot is supported by $4^{th}$, and $5^{th}$ metatarsal, Grade 1 — Lateral edge of the foot is half of that of the metatarsal support, Grade 2 — The support of central zone and forefoot are equal, Grade 3- The support of central zone of the foot is greater than the width of the metatarsal support.

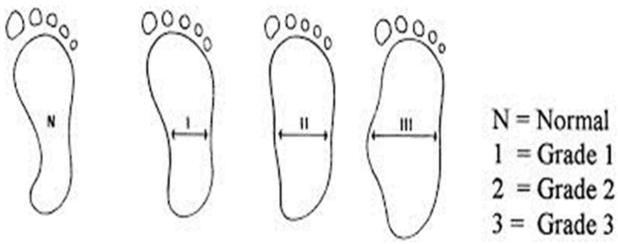


**Figure 1: Plantar footprint classification as defined in "Methods" according to Denis**

The reliability of the instrument was evaluated using the Retest test process. The correlation coefficient was r=0.81, which was very high. Hence, the tools were considered reliable and feasible for proceeding with the main study. SRM College of Nursing, SRM IST, Kattankulathur, has accepted the research proposal. The Manager, SRM Health Sciences, received a formal authorisation. After describing the purpose and length of the study, the study participants gave their consent to participate in the study. The person has been given an assurance that the report will be kept confidential. Students were explained in depth regarding the experiment, and the student's permission was taken to take part in the study.

Elevation and heaviness were measured using standard equipment on students with light clothes and without shoes. The Measuring machine was used to measure the nearest 0.1 kg of weight. The height, using a measuring tape, was measured to the nearest 0.5 cm.

**Table 1: Frequency and percentage distribution of college students demographic variables N=102**

| S. No. | Variable demographics | Class | No. of Respondents | Percentage |
|---|---|---|---|---|
| 1 | Age | 17 - 20 Years | 42 | 41.18% |
| | | 21 - 23 Years | 40 | 39.22% |
| | | 24 - 26 Years | 20 | 19.61% |
| 2 | Gender | Female | 63 | 61.76% |
| | | Male | 39 | 38.24% |
| 3 | Height (in meter) | 1.40 - 1.53 | 34 | 33.33% |
| | | 1.54 - 1.66 | 54 | 52.94% |
| | | 1.67 -1.79 | 14 | 13.73% |
| 4 | Weight (in Kgs) | 50 – 75 | 43 | 42.16% |
| | | 76– 100 | 54 | 52.94% |
| | | 101– 125 | 5 | 4.90% |
| 5 | BMI | 25 – 34 | 76 | 74.51% |
| | | 35– 43 | 21 | 20.59% |
| | | 44– 52 | 5 | 4.90% |

**Table 2: Frequency and percentage of flat-foot level distribution among overweight college students N=102**

| Sl.no | Variables | | Scoring | | |
|---|---|---|---|---|---|
| | | | Grade 1 | Grade 2 | Grade 3 |
| 1 | Age | 17-20 Years | 18 | 11 | 4 |
| | | 21-23 Years | 8 | 11 | 0 |
| | | 24-26 Years | 7 | 3 | 1 |
| 2 | Gender | Male | 12 | 14 | 3 |
| | | Female | 21 | 11 | 2 |
| 3 | Height in Meter | 1.40-1.53 | 16 | 12 | 4 |
| | | 1.54-1.66 | 14 | 12 | 1 |
| | | 1.67-1.79 | 3 | 1 | 0 |
| 4 | Weight in Kg | 50-75 | 16 | 10 | 1 |
| | | 76-100 | 17 | 13 | 1 |
| | | 101-125 | 0 | 2 | 3 |
| 5 | BMI | 25-34 | 22 | 13 | 1 |
| | | 35-43 | 10 | 10 | 2 |
| | | 44-52 | 0 | 2 | 2 |

The student was forced to stand to determine the height with the heel, buttocks, shoulders and occiput hitting the wall. The head should be placed upright in a horizontal plane, with external auditory meatus and lower orbit boundary. The BMI (Body Mass Index) for each subject was determined using Standard Quetelet Index protocol: weight (kg)/height2 (m).

The students were asked to wash their feet, after which they would dry properly. Their foot was impregnated with the stamp ink, and the impression was taken in the anatomical position using the white paper with barefoot relaxing. The plantar footprint was then graded into three grades of flat-foot, according to Denis. Plantar footprint in the second or third degree was considered flatfooted. Without pathological significance, subjects with first-degree plantar footprints have evolutionary foot issues. To analyse the results of the report, the data gathered was organised and tabulated. Data were analysed using descriptive and inferential statistical methods.

This Table 1 shows that 42 (41.18 per cent) of them are in the 17-20 year age group, and 20 (19.61 per cent) are in the 24-26 year age group. 63 were female (61.76 per cent) and 39 were male (38.24 per cent).

**Table 3: Association among college students at flat foot level with their demographic variables N=102**

| Sl.no | Variables | | Scoring | | | Chi-square | Inference |
|---|---|---|---|---|---|---|---|
| | | | Grade 1 | Grade 2 | Grade 3 | | |
| 1 | Age | 17-20 Years | 18 | 11 | 4 | 0.259 | NS |
| | | 21-23 Years | 8 | 11 | 0 | | |
| | | 24-26 Years | 7 | 3 | 1 | | |
| 2 | Gender | Male | 12 | 14 | 3 | 0.268 | NS |
| | | Female | 21 | 11 | 2 | | |
| 3 | Height in Meter | 1.40-1.53 | 16 | 12 | 4 | 0.626 | NS |
| | | 1.54-1.66 | 14 | 12 | 1 | | |
| | | 1.67-1.79 | 3 | 1 | 0 | | |
| 4 | Weight in Kg | 50-75 | 16 | 10 | 1 | 0.00 | S |
| | | 76-100 | 17 | 13 | 1 | | |
| | | 101-125 | 0 | 2 | 3 | | |
| 5 | BMI | 25-34 | 22 | 13 | 1 | 0.026 | S |
| | | 35-43 | 10 | 10 | 2 | | |
| | | 44-52 | 0 | 2 | 2 | | |

In terms of height (In meter) 54 students (52.94 per cent) were between 1.54 and 1.66 metres, while 14 students (13.73 per cent) were between 1.67 and 1.79 metres.

In terms of weight (in kilogrammes), the table shows that 43 of them (42.16%) weigh between 50-75 kg, 54 of them (52.94%) weigh between 76-100 kg, 5 of them (4.90%) weigh between 101-125 kg. 76 (74.51%) BMI was between 25-34, 21 (20.59%) BMI was between 34-43.5 (4.90%) BMI was between 43-52.

Table 2 reveals that the majority of overweight college students belong to the Grade1 group. In the age-wise group, 18 of them were in Grade 1 flat-foot between 17 years and 20 years, 11 were in Grade 2 flat-foot, and 4 were in Grade 3. For a flat foot. 14 males were flat-foot in Grade 2, and 21 females were flat-foot in Grade 1 concerning gender.

The students ranged in height from 1.40 m to 1.53 m, 16 of them had flat-foot grade 1 and students under 76 to 100 kg weight category 17 had flat foot grade 1 and their BMI ranged from 25 to 34, of which 22 had flat foot grade 1.

Table 3 shows that the study indicates a clear correlation between flat foot levels with their demographic weight variable at 0.00 and with BMI at 0.026. But other variables such as Age, Gender, Height are not significantly related.

## RESULTS AND DISCUSSION

Overweight and obesity in both children and adults have been shown to have a detrimental impact on foot structure and function. Such structural changes appear to be linked to increased foot discomfort, where it has been shown that overweight children experience foot pain significantly more often than their leaner corresponding item do. [8]

In 2009 research carried out by Atamturk (2009) [9] was to search for relationships between these two deformities in adults with large anthropometric variables. This research was conducted in Ankara, Turkey, on 516 community individuals (253 males, 263 females) aged between 18 and 83 years. The mean age for males was 40.5+/-13.4 years and for females was 43.3+/-14.9 years. There were no significant variations in the incidence of both deformities ($p>0.05$) between the genders and age groups. There was no correlation between flat-foot or high-arch appearance and body weight, body height, BMI, foot length, metatarsal width, and shoe size ($p > 0.05$). Only the width of the heel displayed an important correlation with flat-foot involvement ($p=0.027$). Thus, in this sample, the majority of overweight college students belong to the Grade 1 group. In the age-wise group, 18 of them were in Grade 1, 11 of them were in Grade 2 flat-foot and 4 of the age-wise categories, between 17 years and 20 years. Concerning gender, 14 males were flat-foot

in grade 2, and 21 females were flat-foot in grade 1. Students ranging in height from 1.40 m to 1.53 m, 16 of whom were flat-foot grade 1 and students under 76 to 100 kg weight group 17 were flat-foot grade, 1 student whose BMI ranged from 25 to 34, 22 of whom were flat-foot grade, 1 student.

In July 2006, at a high school in Istanbul [10] conducted a 2009 report on flat-foot prevalence in stable Turkish male adolescents. Among 3169 male adolescent participants, twenty-two flat-foot subjects were diagnosed. Flat-foot prevalence was statistically evaluated in this certain age and gender group. It analysed the flat-foot association with weight and height. Flat-foot prevalence was found to be 0.69 per cent. It was not important to equate flat-foot with weight or height. Severe disability can result from a rigid and resistant flat-foot. Therefore, in symptomatic male adolescents, the risk of flat-foot should be kept in mind. Thus, in this study, there is a good correlation between flat foot levels with their demographic weight variable at 0.00 and BMI at 0.026. But other factors such as age, gender, height are not significantly correlated with it.

### Recommendations

1. A large sample size may be used to do further studies.

2. Along with the Denis procedure, other techniques can also be used to locate the flat-foot.

3. In future research, congenital flat feet could be considered.

4. Flat-foot prevalence can be compared with congenital flat-foot, and flat-foot acquired.

## CONCLUSIONS

A strong association between flat foot levels with their demographic weight variable at 0.00 and with their BMI at 0.026 is suggested in the current analysis. There is, therefore, an essential correlation between demographic variables and their footprint.

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### Conflict of Interest

The authors declare that they have no conflict of interest.

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