



COMPARISON OF FOOT ANTHROPOMETRY OF MALES OF HILLY AREAS OF HIMACHAL PRADESH AND MALES OF NORTHERN PLAINS OF INDIA

Anatomy

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ABSTRACT

Present study was done to find out the measurements of dimensions of foot and height in males of Hilly Areas of Himachal Pradesh and males of Northern Plains. This study was done on 200 subjects, 100 males from Hilly areas Himachal Pradesh and 100 males of Northern plains of age group 18-25 years. Prior Informed written consent for the study was obtained from all the subjects both in English and in Vernacular. All foot measurements and height were taken with the help of standard anthropometric instruments (osteometric board and flexible metallic measuring tape). Mean values of right and left foot length, foot breadth and height were found to be higher in the males of Northern Plains. The difference was statistically significant in case of left foot breadth and height.

KEYWORDS

Hilly Areas, Foot, Height, Northern Plains

INTRODUCTION

Every person in this world even belong to same species, each of us having differences in appreciable individualism; even monozygotic twins exhibit little variation in traits. Due to these qualities there is occurrence of change in skeletal framework in different geographical areas.¹ Anthropometric characteristics of a human body is affected with hereditary, environmental, social, cultural, lifestyle and health factors.² In terms of race the people in the region of Hilly Areas of Himachal Pradesh and people of Northern Plains of India were highly associated historically. It was very interesting to find out whether there were significant differences in mean foot dimensions of these people under various social and economical situations. So, the present study was aimed to compare differences in anthropometric dimensions of foot among the two populations.

MATERIAL AND METHODS

100 males of hilly areas of Himachal Pradesh, 100 males of Northern plains (belonging to Punjab, Haryana, Uttar Pradesh, Rajasthan) of age group 18-25 years were taken. Prior informed written consent were taken from all the subjects both in English and vernacular. Cases with foot anomalies, trauma, inflammations and surgery (if any) were excluded because of their unsuitability for the investigation. Equipments used were osteometric board and Flexible metallic measuring tape. Anthropometric measurements measured for study are:

- 1. Height** – In Frankfurt's horizontal plane (obtained by joining infra orbital margin to the upper margin of external acoustic meatus), it was the vertical distance between the vertex (highest point on the head) and the heel touching the floor.
- 2. Foot Length** : It was taken as a straight distance between the pternion (most posteriorly projecting points of heel) and Acropodion (most anterior projecting point) of the first or second toe whichever was bigger when the foot was fully stretched.
- 3. Foot Breadth** : On full stretched foot, it was measured as a straight distance from metatarsaletibiale (the most medially placed point on the head of first metatarsal) and metatarsalefibulare (the most laterally placed point on the head of the fifth metatarsal) After taking all these measurements we have calculated foot index.

$$\text{Foot index} = \frac{\text{Foot breadth}}{\text{Foot length}} \times 100$$

The data was collected and tabulated. Analysis done by using Statistical Package for Social Sciences (SPSS version 24).

RESULTS AND DISCUSSION

Table 1 – Comparison of Foot Length, Foot Breadth and Height of Males of Hilly Areas of Himachal Pradesh and Males of Northern plains

Parameter (cm)	Side	Hilly area Males (n=100) Mean ± SD	Northern plain area Males (n=100) Mean ± SD	p - value
Foot Length	Right	25.29 ± 1.99	25.65 ± 1.89	0.19 NS
	Left	25.17 ± 2.00	25.54 ± 1.89	0.18 NS

Foot Breadth	Right	8.74 ± 0.71	8.94 ± 0.79	0.06 NS
	Left	8.72 ± 0.70	8.96 ± 0.81	0.02 *
Height		166.66 ± 4.19	170.29 ± 6.19	0.0001**

NS - not significant, *Significant, ** Highly significant

Table 2 - Foot Index of Male residents of Hilly areas of Himachal Pradesh and Northern Plains

Parameter (cm)	Side	Hilly area Males (n=100) Mean ± SD	Northern plain area Males (n=100) Mean ± SD	p - value
Foot Index	Right	34.65 ± 2.79	34.94 ± 2.73	0.45 NS
	Left	34.84 ± 2.72	35.10 ± 2.66	0.49 NS

Table 1 shows comparison between the foot length and foot breadth of male residents belonging to Hilly Areas of Himachal Pradesh and Northern plains. In the males of Northern Plains, left as well as right foot length was found to be slightly higher as compared to males of Hilly Areas. But the difference was not statistically significant while left foot breadth and height were found to be significantly higher in male residents of Northern Plains as compared to males of hilly Areas.

Table 2 shows variations of foot index in male residents belonging to Hilly Areas of Himachal Pradesh and Northern Plains. In males of Northern Plains left as well as right foot index was found to be slightly higher as compared to Hilly Areas residents and the difference was not statistically significant.

Present study agreed with findings of Manuel I³ which stated that the people living in warmer climates having longer arms and legs than people of colder climates, also tropical environment dwellers having longer limbs than temperate region. Larger foot dimensions were also adaptation to tropical environmental condition because they increase with increase in surface area available for heat loss.³

Population from which the data was collected due to inherent population, variations in these dimensions which may be attributed to ethical, genetic, regional and environmental factors like congenital conditions, climatic factors, physical activities, socio-economic status, nutritional conditions and practice of using different footwear.^{4,5} Human foot, the base of bipedal locomotion, is a highly complex multi bone structure with total of 26 bones on each side along with many articulations. It is being required for walking, stabilization, for weight bearing in erect position and accordingly for adjustment to uneven surfaces where they are being kept. Qualitative analysis of foot dimensions necessitates for better development in the field of ergonomics, forensic science and anthropometry.

Present studies can be successively utilized in forensic studies of foot for personal identification. These finding may be helpful in both shoe

design as well in selection of shoe size. Study also showed that one can try shoe on right side first to consider how it will fit.³

CONCLUSION

In the males of Northern Plains, mean values of right, left foot length and right foot breadth were found to be higher as compared to males of Hilly Areas but the difference was not statistically significant in the study groups. The left foot breadth and Height of males of Northern plains were found to be significantly higher as compared to males of Hilly Areas of Himachal Pradesh.

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