

# A NOTE ON THE FOOT AND STATURE CORRELATION OF CERTAIN BENGAL CASTES AND TRIBES.

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## INTRODUCTION.

The present note\* is based on measurements of length and breadth of foot and stature of 113 adult males from different parts of Bengal. All the measurements were taken by one of us (B. N. D.), the other collaborator being responsible for the analysis and the form of the paper. The subjects belong to a number of different castes which may be considered fairly representative of Bengal.

Stature was measured with the Anthropometer in the vertical exact position with bare feet. Foot-length and foot-breadth were measured with callipers on the lines of the directions given in R. Martin's *Lehrbuch der Anthropologie*, 2nd edition, 1928, Volume I, Nos. 58 and 59, p. 167, but with bare feet.

The length of the right foot was measured as the direct distance in a straight line from the Pternion to the Akropodion. The breadth of the right foot was measured as the direct distance in a straight line of the median metatarsal point from the lateral metatarsal point.

The instrument used were made by Paul Hermann of Zürich.

The biometrical analysis was carried out separately for the following groups:—

(1) 21 Brahmins; (2) 22 Kayasthas; (3) 46 upper castes consisting of 21 Brahmins, 22 Kayasthas and 3 Baidyas pooled together; (4) Santhals; and (5) 55 other castes pooled together.

The mean value and standard deviation for the three characters, and the coefficients of correlation with corresponding standard errors are showed in the Table 1.

TABLE 1. OBSERVED STATISTICS FOR FOOT-LENGTH, FOOT-BREADTH AND STATURE OF BENGAL CASTES.

Caste	Size of Sample	Foot-Length (cm.)		Foot-Breadth (cm.)		Stature (cm.)		Correlation Coefficients		
		Mean	S.D.	Mean	S.D.	Mean	S.D.	F-L. ×F-B.	F-L. ×St.	F-B. ×St.
(1) Brahmins	21	24'505	1'076	9'176	0'582	166'286	8'322	+0'533	+0'372	-0'071
(2) Kayasthas	22	24'727	1'392	9'255	0'509	164'791	6'470	+0'310	+0'497	+0'310
(3) Upper Castes†	46	24'638	1'223	9'244	0'549	165'885	7'134	+0'424	+0'403	+0'093
(4) Santhals	12	25'158	0'995	9'800	0'711	160'883	11'859	+0'601	+0'003	-0'140
(5) Other Castes	55	24'738	1'426	9'389	0'641	192'258	5'105	+0'423	+0'480	+0'499
<b>Total</b>	<b>113</b>	<b>24'758</b>	<b>1'304</b>	<b>9'373</b>	<b>0'629</b>	<b>163'568</b>	<b>7'112</b>	<b>+0'446</b>	<b>+0'319</b>	<b>+0'126</b>

\* Read before the Anthropological Section of the Indian Science Congress, Calcutta, January 1935.

† Upper castes consist of Brahmins, Kayasthas and Vaidyas pooled together.

For purposes of analysis of variance three groups were used: (1) upper castes 46, (2) Santhals 12, and (3) other castes 55. The actual results are shown below in Table 2.

TABLE 2. ANALYSIS OF VARIANCE FOR THREE GROUPS OF CASTES.

Factor of Variation	Degrees of Freedom	Sum of Squares	Variance	Ratio of Variances		
				Observed	5%	1%
Foot-Length. (118)						
Between Castes	2	2.22	1.11	0.65	3.07	4.80
Within Castes	110	187.98	1.71			
<b>Total</b>	<b>112</b>	<b>190.15</b>				
Foot-Breadth (118)						
Between Castes	2	2.98	1.49	3.98	3.07	4.80
Within Castes	110	41.18	.37			
<b>Total</b>	<b>112</b>	<b>44.16</b>				
Stature (118)						
Between Casts	2	417.21	208.60	4.37	3.07	4.80
Within Casts	110	5245.77	47.69			
<b>Total</b>	<b>112</b>	<b>5662.98</b>				

It will be seen that differences in foot-length are not significant, but differences in foot-breadth and stature are both significant on the five per cent level.

The results of comparisons between individual castes are shown in the values of the t-statistics for the three characters given in Table 3.

TABLE 3. VALUES OF 't'.

	Degrees of Freedom	Foot-length	Foot-breadth	Stature	5% Value
Brahmins (21) × Kayasthas (22)	41	0.588	0.471	0.659	2.01
" × Santhals (12)	81	1.719	2.734	1.535	2.04
" × Other Castes (55)	74	0.668	1.327	2.556	1.96
Kayasthas (22) × Santhals (12)	32	0.946	2.598	1.250	2.04
" × Other Castes (55)	75	0.015	0.878	1.819	1.96
Upper Castes (46) × Santhals (12)	56	1.242	2.938	1.845	1.97
" × Other Castes (55)	99	0.188	1.212	2.929	1.96
Santhals (12) × Other Castes (55)	65	0.981	1.975	0.640	1.96

Most of the values are insignificant possibly due to the small size of the samples. The most primitive Santhals however appear to be significantly differentiated in having the widest foot-breadth.

It is interesting to note certain general tendencies in the result, although they are not all statistically significant owing possibly to the small size of the samples.

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The upper castes, Brahmins ( $166.3 \pm 1.2$ ), and Kayasthas ( $164.8 \pm 0.9$ ) have higher stature than the other castes ( $162.2 \pm 0.5$ ), while the Santhals, a primitive tribe, have the shortest stature ( $160.3 \pm 2.3$ ). The average length of the foot on the other hand is slightly smaller for the upper castes; Brahmins ( $24.5 \pm 0.2$ ), Kayasthas ( $24.7 \pm 0.1$ ), other castes ( $24.7 \pm 0.1$ ); while the Santhals have the longest foot-length ( $25.2 \pm 0.2$ ). The breadth of the foot also appears to change systematically according to the social status of caste. The foot-breadth is smallest among the Brahmins ( $9.2 \pm 0.1$ ) Kayasthas ( $9.3 \pm 0.1$ ), other castes ( $9.4 \pm 0.1$ ); while the Santhals have the widest foot-breadth ( $9.8 \pm 0.1$ ).

The coefficients of correlation shown in Table 3 are significant in many cases, as can be seen from the transformed z-values given in the following Table 4.

TABLE 4. TRANSFORMED z-VALUES OF COEFFICIENTS OF CORRELATION.

Castes	Size of Sample	Foot-length × Foot-breadth	Foot-length × Stature	Foot-length × Stature
(1) Brahmins	21	0'594 ± '285	0'891 ± '286	-0'071 ± '285
(2) Kayasthas	22	0'820 ± '229	0'545 ± '229	0'820 ± '229
(3) Upper Castes combined	46	0'452 ± '152	0'428 ± '152	0'098 ± '152
(4) Santhals	12	0'694 ± '388	0'008 ± '388	-0'141 ± '388
(5) Other Castes	55	0'451 ± '189	0'523 ± '189	0'548 ± '189
Total	118	0'479 ± '095	0'881 ± '095	0'127 ± '095

The correlation between foot-length and foot-breadth is statistically significant and quite high, being about +0.45 for the pooled data. The correlation between stature and foot-length is smaller but statistically appreciable; the pooled value being about +0.32. The correlation is +0.40 for the upper castes, and +0.48 for other castes, but is negligibly small for Santhals.

The correlation between foot-breadth and stature is however statistically inappreciable in every case. So far as the present sample is concerned, foot-breadth appears to vary practically independently of the stature. The size of sample is too small in most cases to make it profitable to compare the values of the coefficients of correlation for different castes.

### COMPARATIVE DATA.

Some anthropologists have used the foot-length index defined by (foot-length × 100) stature for purposes of comparison. The average value of this index calculated from the mean values, standard deviations and the correlation between foot-length and stature is 15.03 for the present sample as a whole ( $n=113$ ).

Von Eickstedt<sup>1</sup> in his *Rassenelements der Sikh* has given the foot-length and stature index of 76 Jat-Sikhs as 15.53. Martin<sup>2</sup> also has given the relative index of some male Indians namely, Toda=15.2, Irular=15.3, Brahman=15.4, and Sikh=15.5, of which the value for the Sikhs was probably taken from the Census of India 1911. From the above data it seems likely that the "foot-length-stature" index for the present Bengali people is slightly smaller than those for other Indian groups mentioned above. The difference is however most probably not statistically significant.

<sup>1</sup> R. Martin : *Lehrbuch der Anthropologie*, Bd.I., p. 420.

Matrin says that the foot-length in relation to stature does not show great deviations within the human race.<sup>3</sup> "Die Füsslänge relativ zur Körpergrösse zeigt innerhalb die menschliche Rassen keinegrossen Schwankungen".<sup>4</sup> This is true for the present sample of Bengal subjects. In fact, in India, the foot-length in relation to stature appears to be more or less the same among widely different castes.

SUMMARY.

The chief results are given below :—

(1) The average values of stature, foot-length and foot-breadth appear to vary systematically with the orthodox social hierarchy among the various caste groups in Bengal. The upper castes have a higher stature and a smaller foot-length and foot-breadth than the lower castes. The Santhals, a very primitive people, have the shortest stature, the longest foot-length, and widest foot-breadth.

(2) There is an appreciable and fairly high organic correlation between foot-length and foot-breadth (+0.45), a smaller correlation between foot-length and stature (+0.32), but practically no correlation between stature and foot-breadth showing that the foot-breadth in the individual varies practically independently of the stature.

(3) The average value of the foot-length and stature index is 15.03 which is slightly smaller than the value of the same index in several other Indian groups. It is possible that the "foot-length and stature" index is a fairly stable characteristic which does not fluctuate appreciably between different caste groups.

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<sup>3</sup> *Op. cit.* p. 421.

<sup>4</sup> *Zeitschrift für Ethnologie*, 1920-21. Heft 4/5, p. 337.