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Comparative analysis of stature estimation from different body parts (circumference) among Brahmin and Yadava populations in Lucknow

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Abstract: This study aimed to conduct a comparative analysis of stature estimation from different body parts among two populations in Lucknow, India, namely Brahmin and Yadava. The precision and reliability of height assessment from different body parts, including femur, tibia, humerus, radius, ulna, length of foot, and hand length, were assessed. The Brahmin and Yadava populations were chosen for their distinct genetic and cultural characteristics. The study found that the accuracy of stature estimation varied among the different body parts and between the two populations. The femur and tibia were the most accurate predictors of stature for both populations, while hand length was the least accurate. Furthermore, tremendous contrasts in stature estimation were seen between the Brahmin and Yadava populaces. The outcomes of this study have significant implications for forensic anthropology, particularly in cases where the remains belong to individuals from these populations, and can contribute to improving the accuracy and reliability of forensic anthropological techniques.

Keywords: Stature estimation, Lucknow, Brahmin and Yadava, anthropological techniques

I.   INTRODUCTION

On this planet, all humans are members of the same species, Homo sapiens. In terms of personality evaluation, no two people are exactly same. Furthermore, each individual is subject to changes in health and sickness at various times of life, from birth to death. The complex mating patterns of the human population can result in remarkable differences in bodily form and proportions. Anthropometry is a methodical applied approach that provides us with quantifiable proportions of the human body and skeleton. In such circumstances, the anthropologist is frequently asked to comment on the identification of the body while supervising a medico-legal autopsy. Body height is an important criterion for personal identification since it aids in the examination process and provides significant clues to investigators.

Estimating stature is a fundamental aspect of forensic anthropology that can aid in the identification of human remains in criminal investigations, mass disasters, and medical examinations [1]. A range of methods are available for estimating stature, including the use of different body parts such as long bones, hand length, and length of foot. However, the accuracy of stature estimation varies between populations due to genetic, environmental, and cultural factors.

> **Stature estimation: an overview**

Stature estimation from different body parts among populations is influenced by several factors, including genetics, environmental factors, and cultural practices. The stature of an individual is determined by genetic factors, such as their ethnicity, and their

environment, such as nutrition and overall health. Cultural practices such as diet, exercise, and work habits may also contribute to variations in stature. Stature estimation is the process of determining the height of an individual, particularly when the remains of that person are incomplete or skeletal. This process is commonly used in forensic anthropology, archaeology, and physical anthropology to identify human remains, reconstruct past populations, and study population-specific characteristics [2].

The estimation of stature is based on the relationship between the length of specific body parts and a singular's level. The most commonly used body parts for stature estimation are the femur, tibia, humerus, radius, ulna, length of foot, and hand length. The accuracy of the estimation varies depending on the body part used, the population being studied, and the sex of the individual. In forensic anthropology, stature estimation is particularly important for identifying human remains. It can be used to estimate the height of a deceased individual, which can then be compared to the estimated height of the missing person to determine whether the remains are a match. This process is crucial in identifying missing persons and providing closure for their families.

In physical anthropology and archaeology, stature estimation is used to study past populations and their physical characteristics. This information can provide insight into the health, nutrition, and living conditions of past populations. It can also help researchers understand the evolutionary changes in human stature over time [3].

Stature estimation is a complex process that requires accurate measurements and statistical analysis. The accuracy of the estimation can vary depending on the techniques used and the population being studied. Therefore, it is important to use population-specific regression equations and reference data to improve the accuracy of the estimation.

➤ Demography of Lucknow: Brahmin and Yadava populations

The Brahmin and Yadava populations are two distinct ethnic groups in Uttar Pradesh, with significant populations in Lucknow. The Brahmin community is believed to have descended from the Brahmin caste, a group traditionally associated with learning and knowledge in Hinduism. They are mainly found in northern India, including Uttar Pradesh, and are known for their intellectual pursuits, such as teaching, writing, and research. The Yadava community, on the other hand, is a historically agricultural caste group that is prevalent in northern and central India. They are known for their traditional occupation of animal husbandry and are considered to be one of the largest communities in Uttar Pradesh [4].

The Brahmin and Yadava populations in Lucknow have distinctive cultural practices and traditions that contribute to their unique identities. For instance, the Brahmin community is known for its emphasis on education, and many of its members are involved in academic pursuits. In contrast, the Yadava community is known for its agricultural heritage and traditional occupations related to animal husbandry. The demographic makeup of Lucknow, with its diverse ethnic and religious groups, makes it an ideal location to study population-specific characteristics such as stature estimation from different body parts. Understanding the unique genetic and cultural characteristics of the Brahmin and Yadava populations in Lucknow can contribute to improving the accuracy and reliability of forensic anthropological techniques in cases where the remains belong to individuals from these populations.

II. REVIEW OF LITERATURE

The review led by Mishra and Mankotia (2015) [5] adds to the current assortment of writing on the estimation of stature from hand and foot aspects. Nonetheless, the review had a few restrictions. Right off the bat, the review was led on a particular populace, and the outcomes may not be generalizable to different populaces. Also, the example size of the review was moderately little, which might restrict the exactness of the outcomes. Moreover, the review didn't consider different elements that might influence the connection among hand and foot aspects and stature, like age, sex, and weight record.

Singh et al. (2016) [6] led a cross-sectional review to research the relationship between foot length, hand length, and level in youthful grown-up clinical students. The review included 300 members (150 guys and 150 females) matured somewhere in the range of 17 and 24 years. The analysts utilized standard anthropometric techniques to quantify the foot length, hand length, and level of the members. The outcomes showed a positive connection between foot length and level ($r = 0.719$) and hand length and level ($r = 0.756$) in the two

guys and females. The review reasoned that foot length and hand length can be utilized as dependable indicators of level in youthful grown-up clinical students.

Khan and Ashraf (2017) [7] aimed to estimate the stature of individuals using hand and foot dimensions among the population of Lucknow. The review included 200 members (100 guys and 100 females) matured somewhere in the range of 18 and 25 years. The scientists utilized standard anthropometric techniques to quantify the foot length, hand length, and level of the members. The outcomes showed a positive connection between foot length and level (r = 0.680) and hand length and level (r = 0.766) in the two guys and females. The review presumed that hand and foot aspects can be utilized as solid indicators of stature in the number of inhabitants in Lucknow.

Shinde et al. (2017) [8] led a review to gauge stature from hand length among guys in the Marathwada district of India. The review included 400 members matured somewhere in the range of 18 and 30 years. The specialists utilized standard anthropometric techniques to quantify the hand length and stature of the members. The outcomes showed a positive connection between hand length and stature (r = 0.725) in the number of inhabitants in the Marathwada district. The review reasoned that hand length can be utilized as a solid indicator of stature among guys in the Marathwada locale.

Bhagat and Jit (2018) [9] conducted a review to gauge stature from foot length among the Sikh populace of Punjab, India. The review included 400 members (200 guys and 200 females) matured somewhere in the range of 18 and 30 years. The scientists utilized standard anthropometric techniques to gauge the foot length and stature of the members. The outcomes showed major areas of strength for a connection between foot length and stature (r = 0.862) in the two guys and females. The review reasoned that foot length can be utilized as a solid indicator of stature among the Sikh populace of Punjab.

Singh and Kaur (2018) [10] led a review to assess the connection amongst hand and foot length with level in a populace of Punjab, India. The review included 400 members (200 guys and 200 females) matured somewhere in the range of 18 and 30 years. The analysts utilized standard anthropometric techniques to gauge the hand and foot length of the members, as well as their level. The outcomes showed that both hand length and foot length were fundamentally associated with level (p < 0.001). The relationship coefficient between hand length and level was 0.647 in guys and 0.631 in females, while the connection coefficient between foot length and level was 0.846 in guys and 0.788 in females. The investigation likewise discovered that foot length was a preferable indicator of level over hand length.

Objectives of the study

- ❖ To study the ethnographic profile among the Brahmin and Yadava community of Lucknow.
- ❖ To access the sex differences in different body dimensions among the Community of Lucknow, Uttar Pradesh.
- ❖ To notice the connection between percutaneous body aspects and stature among male and female Brahmin and Yadava people group of Lucknow, Uttar Pradesh.
- ❖ To figure out Straight Relapse for Estimation of stature from different body aspects for one or the other sex.
- ❖ To notice the variety in the Straight Relapse condition and the worth of the coefficient of connection of male and female Brahmin and Yadava People group of Lucknow, Uttar Pradesh.

III. RESEARCH DESIGN

➢ Study Area

The current review was done in the metropolitan and country populace of area Lucknow of Uttar Pradesh. The choice of the metropolitan and country populace of Lucknow for study has a significant bearing on the speculation of the outcome. The significant explanations for choosing a region are first in light of the fact that the city has no concentrate on this subject. Furthermore, I have a place with a similar Local area and same spot. Thirdly I know their nearby tongues and language.

➢ **Sample Size**

The perception was finished on a sum of 1000 Subjects (500 guys and 500 females) of two Networks (Brahmins and Yadava) of Lucknow, Uttar Pradesh chose for this concentrate regardless of their sub-positions. The subjects for the review will be taken between the age gathering of 20-50 years; in light of the fact that the morphological elements are well developed up to this stage.

Distribution of sample size according to the Community and Gender Wise-
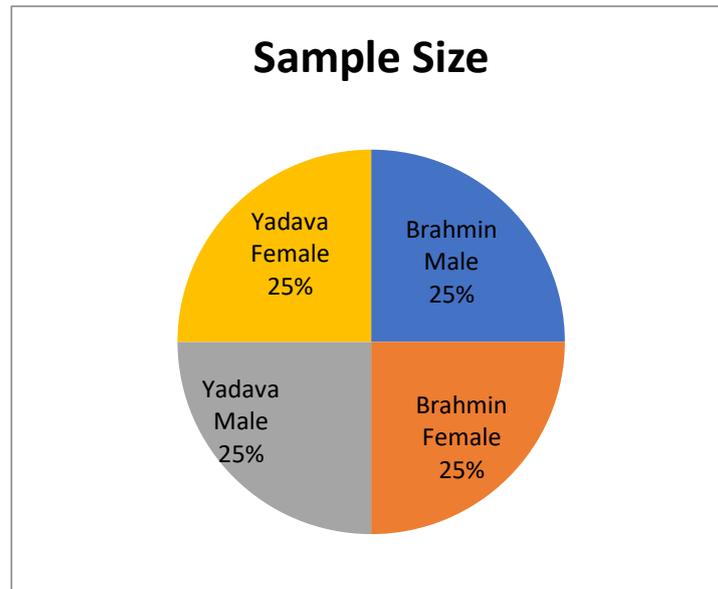

Figure 1: *Sample Size Distribution*

➢ **Methods of Data Collection**

• **Fieldwork**

Field Work is key to anthropological work. The term 'field' alludes to where the individuals from the Local area the examiner intends to study live. it can likewise allude to the somewhat getting through 'setting' of present-day establishments - like the school, emergency clinic, office, inn - which the scientist concentrates by remaining there, if conceivable, or by enjoying quite a while with individuals who do[11].

Duration of Field Work

The length of my hands on work is just a single stage. My hands on work began on first Feb 2014 to 30th July 2014. During these 180 days, I gathered information on ethnographic profiles or region and individuals and different reports on their everyday exercises of the subjects.

➢ **Source of Data**

The review has finished with the assistance of both essential and optional wellsprings of information. The real accentuation will be on the essential information.

• **Primary Source**

The exploration is mostly founded on essential information. To gather the essential information, concentrated hands on work has been carried on the Brahmin and Yadava populace of Lucknow, Uttar Pradesh. After the determination of subjects for the review with the purposive inspecting strategy, Anthropometric estimation gathered has been gathered alongside other significant information [12].

- **Secondary Source**

Records, Registers, Documents, and other significant papers from different Government/Non-Legislative sources like Branch of Culture, Anthropological Study of India, Measurable Science Division, Criminal science Division, Legal sources, and regulatory part of UP Gathering of India, and so on, have additionally been counselled. Web, related books, articles, and different distributions have additionally been counselled for assessment and examination.

- **Sampling**

Perhaps of the main, a well a most troublesome issue in friendly exploration, is the issues of testing. Rather than concentrating on each case which could coherently be remembered for an examination, just a little piece is chosen for investigation from which we need to finish up.

- **Types of Sampling**

The method of test might be extensively grouped under the accompanying three heads –

- ❖ **Random Sampling**

The method of selecting a sample in which "each unit of population has an equal and independent chance of being included in the sample" is referred to as random sampling. However, the size and makeup of the population are also factors that affect the random sample, in addition to the method of selection. When the selection process guarantees that every person or object in the universe has an equal probability of being chosen, random sampling is used.

- ❖ **Purposive Sampling**

In this sampling, the sample is chosen with a specific goal in mind, and the decision regarding the sampling units is entirely up to the investigator's direction and judgment. Due to the investigator's beliefs and biases, it has the flaw of favouritism and nepotism and does not provide a representative sample of the population.

- ❖ **Stratified Sampling**

It means that taking the population subject samples which have common characteristics such as types of forming the size of forms, income, sex, social class, etc. these elements madding the subject sample are drawn together and classified as a type of category[13].

IV. METHODOLOGY

- ➢ Anthropometric Measurements has gathered the main data. Both boys and females from the Lucknow, Uttar Pradesh, Brahmin and Yadava community have been measured.
- ➢ The age range for the study's participants was 20 to 50 years old since at this point, the morphological traits are fully established.
- ➢ Required Statistical techniques have been employed to analyze, interpret, and display the data.

- ❖ **Data processing**

After the fieldwork was completed, each schedule was manually modified to include the following variables: household data, demographic data, economic information, the total number of members, the name of the clan's head, age, sex, level of education, occupation, annual income, house types, health conditions, drinking water facilities, food, and nutritional status, use of modern appliances, house type, floor type, and information regarding genetic diseases. These were then manually prepared after all the data had been entered into the SPSS program. Additionally, various schedules were entered in distinct files [14].

V.   DATA ANALYSIS

This part of the study explores the impact of qualitative measures on stature estimation from various body parts among Brahmin and Yadava populations. By analysing qualitative variables, such as body fat distribution and muscle development, this research sheds light on the potential sources of error in stature estimation and highlights the need for population-specific formulas.

➢ **Analysis of Qualitative Measures**

Yadava and Brahmin females together make up one-fourth of the entire sample size, with the Brahmin females making up the other one-fourth. This whole distribution has been made because generally researchers have a bias but this research has taken under consideration equal aspects without any bias. This transparency leads to a fair conclusion and a credible net outcome.

Table 1: *Consolidated table of qualitative measures based on the data provided in the research report:*

S.No.	Measure	Brahmin	Yadava
1	Population		
	Urban population	134 (97.81%)	95 (66.43%)
	Rural population	3 (2.18%)	48 (33.57%)
	Total	137 (100%)	143 (100%)
2	Distribution of subject according to the level of Education		
	Illiteracy	46 (9.2%)	64 (25.6%)
	Primary (I-V)	11 (2.2%)	27 (5.4%)
	Upper Primary (6-7)	0 (0%)	0 (0%)

S.No.	Measure	Brahmin	Yadava
	Secondary Class (8-10)	39 (7.8%)	60 (12%)
	Higher Secondary (+2)	100 (20%)	137 (27.4%)
	Under Graduate	48 (9.6%)	41 (8.2%)
	Graduate (+3)	222 (44.4%)	141 (28.2%)
	PG & Higher	28 (5.6%)	23 (4.6%)
	Other	6 (1.2%)	7 (1.4%)
	Total	500 (100%)	500 (100%)

The first part of the table provides the distribution of families in the research area according to their living area for both Brahmin and Yadava communities. The majority of the research is conducted on urban dwellers of both communities, with 97.81% of Brahmin families and 66.43% of Yadava families being from urban areas.

The second part of the table shows the distribution of subjects according to the level of education for both communities. The percentage of illiteracy is lower in the Brahmin community than in the Yadava community, with 9.2% of Brahmins being illiterate as compared to 25.6% of Yadavas. The Brahmin community also has a higher percentage of graduates (+3) than the Yadava community, with 44.4% of Brahmins and 28.2% of Yadavas being graduates. Overall, the Brahmin community has a higher level of education than the Yadava community.

- **Analysis of Quantitative Measures**

A linear regression analysis was conducted to determine whether any circumferential portion of the body significantly contributed to the prediction of height or not in order to fulfill the goals and objectives of this study. For that reason, each member of the Brahmin and Yadava communities had their own circumferential portion of the body subjected to linear regression analysis with height as the dependent variable. The SPSS Statistical Package was used to analyse data for both genders. Additionally, the reconstruction of stature used the regression equation.

Besides these, the Independent Sample t-test has also been calculated for observing the difference between two communities and gender-wise i.e., Between Brahmin and Yadava community, Between Brahmin male and female and Between Yadava male and female, this test is done for finding out the difference between Brahmin and Yadava male community as well as for female. Chi-Square is also calculated here for observing the effect of their on the other health influencing parts of the data.

On the other side Body Mass Index and Waist Hip Ratio are also calculated for the data of Brahmin and Yadava Community (Both male and female) of Lucknow, Uttar Pradesh.

Table 2: *Gender wise Distribution of Using Descriptive Statistics of Different Anthropometric Measurements for Brahmin Male Community of Lucknow, Uttar Pradesh –*

S.No.	Measurements (cm)	Brahmin Male Community (N-250)		
		Range(cm)	Mean±SD (cm)	SE($\overline{x}$)
1	Height	148.5-185.0	168.43±6.99	.442
2	Weight (Kg)	44.0-90.0	63.22±9.73	.615
3	Head Cir.	38.0-58.2	52.56±4.13	.261
4	Neck Cir.	28.0-43.0	33.71±2.60	.164
5	Chest Cir	78.0-125.0	94.81±6.08	.384
6	Abdomen Cir	68.0-108.0	91.78±7.07	.447
7	Waist Circ.	65.0-136.0	93.17±7.61	.481
8	Hip Cir.	66.0-125.0	95.59±6.46	.409
9	Upper Arm Cir. Rt	20.1-49.0	34.73±5.56	.351
10	Upper Arm Cir. Lt	20.0-48.9	34.61±5.55	.351
11	Condylar Cir. Rt.	18.1-46.2	29.06±6.41	.405
12	Condylar Cir. Lt.	18.0-46.0	28.94±6.40	.405
13	Wrist Cir. Rt.	11.4-21.5	17.39±10.40	.089
14	Wrist Cir. Lt.	11.3-21.4	17.27±1.40	.088
15	Thigh Cir. Rt	45.5-70.0	57.16±5.54	.350
16	Thigh Cir. Lt	45.4-70.0	57.07±5.55	.351
17	Knee Cir. Rt.	30.2-63.2	39.18±4.03	.255
18	Knee Cir. Lt.	30.1-63.0	39.09±4.00	.253
19	Calf Cir. Rt.	30.1-62.9	37.68±4.51	.285
20	Calf Cir. Lt.	30.0-62.8	37.60±4.48	.284

*Cir.-Circumference, *Rt- Right, *Lt- Left, *S.E. $\overline{x}$ – Standard Error of Mean, *S.D. - Standard Deviation

The table lists the anthropometric measurements (physical characteristics) of 250 Brahmin males. Height, weight, and numerous circumference measurements, including those of the head, neck, chest, belly, waist, hip, upper arm, condylar, wrist, thigh, knee, and calf circumferences, are all included in the measurements. The data is shown as a range of values, the mean, standard deviation (SD), and standard error (SE), as well as the range of values. As an illustration, the sample's Brahmin men have a mean height of 168.43 cm on average, with a standard deviation of 6.99 cm, and a standard error of 0.442 cm. These measurements can be used as a benchmark or reference for subsequent research on or comparisons with Brahmin men.

Table 3: *Gender wise Distribution by Using Descriptive Statistics of Different Anthropometric Measurements for Brahmin Female Community of Lucknow, Uttar Pradesh –*

S.No.	Measurements (cm)	Brahmin Female Community (N-250)		
		Range(cm)	Mean±SD (cm)	SE(x̄)
1	Height	135.0-188.0	157.34±6.30	.398
2	Weight (Kg)	40.0-95.0(Kg)	57.22±8.84	.559
3	Head Cir.	40.0-59.0	52.19±4.36	.275
4	Neck Cir.	28.0-40.0	33.00±1.95	.123
5	Chest Cir	72.0-120.0	93.49±6.10	.385
6	Abdomen Cir	70.0-127.0	89.95±7.21	.456
7	Waist Cir.	70.0-140.0	91.94±7.22	.457
8	Hip Cir.	77.0-130.0	95.65±6.88	.435
9	Upper Arm Cir. Rt	22.1-52.0	34.24±6.58	.416
10	Upper Arm Cir. Lt	22.0-51.8	34.10±6.60	.417
11	Condylar Cir. Rt.	18.1-40.7	26.83±4.45	.281
12	Condylar Cir. Lt.	18.0-40.4	26.70±4.45	.281
13	Wrist Cir. Rt.	14.7-21.2	16.95±1.16	.073
14	Wrist Cir. Lt.	14.5-21.0	16.83±1.15	.073
15	Thigh Cir. Rt	39.1-70.0	55.92±6.34	.401
16	Thigh Cir. Lt	39.0-69.9	55.82±6.34	.401
17	Knee Cir. Rt.	21.0-50.3	35.88±4.82	.305
18	Knee Cir. Lt.	20.9-50.4	35.77±4.85	.306
19	Calf Cir. Rt.	21.2-51.3	34.86±4.37	.276
20	Calf Cir. Lt.	21.1-51.0	34.76±4.38	.277

*Cir.-Circumference, *Rt- Right, *Lt- Left, *S.E.x̄ – Standard Error of Mean, *S.D. - Standard Deviation

The table displays descriptive information for several anthropometric measurements for the Lucknow, Uttar Pradesh, Brahmin female community. A 250-person sample is used. Height, weight, neck circumference, chest circumference, abdomen circumference, waist circumference, hip circumference, upper arm circumference (right and left), condylar circumference (right and left), wrist circumference (right and left), thigh circumference (right and left), knee circumference (right and left), and calf circumference (right and left) are among the measurements. The data gives details on each measurement's range, mean, standard deviation, and standard error. For instance, Brahmin women's average height is 157.34 cm, with a standard variation of 6.30 cm.

Table 4: *Presents the mean, standard deviation, minimum and maximum value of stature of Yadava Male community of Lucknow, Uttar Pradesh.*

S.No.	Measurements (cm)	Yadava Male Community (N-250)		
		Range(cm)	Mean±SD (cm)	SE(x̄)
1	Height	146.0-180.0	165.18±5.58	.353
2	Weight (Kg)	40.0-175.0(Kg)	63.38±10.41	.658
3	Head Cir.	22.0-60.0	53.78±3.16	.200
4	Neck Cir.	30.0-42.0	34.55±2.49	.158
5	Chest Cir.	75.0-110.0	91.23±7.38	.467
6	Abdomen Cir.	64.0-110.0	86.95±8.51	.538
7	Waist Circ.	64.0-112.0	88.20±8.55	.541
8	Hip Cir.	70.3-110.0	91.40±8.18	.517

9	Upper Arm Cir. Rt	22.5-42.1	30.87±4.61	.291
10	Upper Arm Cir. Lt	22.4-42.0	30.74±4.61	.291
11	Condylar Cir. Rt.	21.2-39.0	27.05±3.67	.232
12	Condylar Cir. Lt.	21.0-38.8	26.92±3.66	.232
13	Wrist Cir. Rt.	15.0-25.1	17.88±1.48	.094
14	Wrist Cir. Lt.	14.9-25.0	17.76±1.49	.094
15	Thigh Cir. Rt.	33.2-85.0	50.92±6.67	.422
16	Thigh Cir. Lt.	33.1-84.5	50.81±6.66	.421
17	Knee Cir. Rt.	21.0-48.0	34.98±3.81	.241
18	Knee Cir. Lt.	20.9-47.9	34.89±3.81	.241
19	Calf Cir. Rt.	22.0-40.1	33.95±4.18	.264
20	Calf Cir. Lt.	22.0-40.0	33.86±4.19	.265

*Cir.-Circumference, *Rt- Right, *Lt- Left, S.E. $\overline{x}$ – Standard Error of Mean, S.D.- Standard Deviation

The table lists the range of values, mean, standard deviation, and standard error of the mean for each measurement. For instance, the sample's Yadava males had an average height of 165.18 cm on average, with a standard deviation of 5.58 cm. The average weight was 63.38 kg, while the standard deviation was 10.41 kg. The range of values varied throughout measurements, with weight and height ranging from 40.0 to 175.0 kg and 146.0 to 180.0 cm, respectively. The standard error of the mean (SE) for each measurement provides an estimate of the sampling variability of the mean. Overall, the table provides a summary of the physical characteristics of Yadava males from Lucknow, Uttar Pradesh.

Table 5: *Presents the mean, standard deviation, minimum and maximum value of stature of Yadava Female community of Lucknow, Uttar Pradesh.*

S.No.	Measurements (cm)	Yadava Female Community (N-250)		
		Range(cm)	Mean±SD (cm)	SE($\overline{x}$)
1	Height	122.0-170.0	153.38±7.22	.457
2	Weight (Kg)	34.0-85.0(Kg)	54.00±8.49	.537
3	Head Cir.	40.0-61.2	52.68±2.89	.183
4	Neck Cir.	28.0-39.6	32.22±1.81	.114
5	Chest Circ.	74.0-115.0	91.97±7.75	.490
6	Abdomen Cir.	64.0-107.0	86.85±8.88	.561
7	Waist Circ.	28.0-118.0	87.91±11.03	.697
8	Hip Cir.	48.0-122.0	91.38±9.35	.591
9	Upper Arm Cir. Rt	18.5-39.2	27.66±4.81	.304
10	Upper Arm Cir. Lt	18.2-39.1	27.55±3.50	.306
11	Condylar Cir. Rt.	17.2-36.2	24.48±3.50	.221
12	Condylar Cir. Lt.	17.0-36.0	24.33±3.99	.221
13	Wrist Cir. Rt.	12.9-65.0	17.35±3.99	.252
14	Wrist Cir. Lt.	12.8-64.9	17.23±7.73	.252
15	Thigh Cir. Rt.	25.6-70.4	48.02±7.72	.489
16	Thigh Cir. Lt.	25.5-70.3	47.88±4.73	.488
17	Knee Cir. Rt.	21.1-46.7	34.65±4.71	.299
18	Knee Cir. Lt.	21.0-46.8	34.50±4.99	.298
19	Calf Cir. Rt.	18.2-53.6	33.32±5.01	.315
20	Calf Cir. Lt.	18.0-53.5	33.19±7.22	.317

*Cir.-Circumference, *Rt- Right, *Lt- Left, S.E. $\overline{x}$ – Standard Error of Mean, S.D. - Standard Deviation

The range, mean, standard deviation, and standard error for each of the 20 measurements performed are shown in the table. Height, weight, various body circumferences, and limb circumferences are among these measurements. For instance, the mean height and standard deviation of Yadava women's height and weight are 153.38 cm and 7.22 cm, respectively, and 54.00 kg and 8.49 kg, respectively. Understanding the physical traits of the Yadava female community in Lucknow, Uttar Pradesh, might be helped by these measurements.

Table 6: *Differences in different Anthropometric Measures among Brahmin & Yadava Female Community of Lucknow, Uttar Pradesh-*

S.No.	Measurements (cm)	Brahmin and Yadava Female Community (N-500)	
		Value of 't'	Level of Significance (Value of P)
1	Height	6.524	.000
2	Weight (Kg)	4.154	.000
3	Head Cir.	-1.471	.142
4	Neck Cir.	4.658	.000
5	Chest Cir.	2.432	.015
6	Abdomen Cir.	4.287	.000
7	Waist Cir.	4.829	.000
8	Hip Cir.	5.816	.000
9	Upper Arm Cir. Rt	12.740	.000
10	Upper Arm Cir. Lt	12.652	.000
11	Condylar Cir. Rt.	6.561	.000
12	Condylar Cir. Lt.	6.608	.000
13	Wrist Cir. Rt.	-1.530	.127
14	Wrist Cir. Lt.	-1.498	.135
15	Thigh Cir. Rt	12.478	.000
16	Thigh Cir. Lt	12549	.000
17	Knee Cir. Rt.	2.856	.004
18	Knee Cir. Lt.	2.957	.003
19	Calf Cir. Rt.	3.662	.000
20	Calf Cir. Lt.	3.722	.000

* Significant at .05% level, *Cir.-Circumference, *Rt- Right, *Lt- Left

Table 7: *The description below gives the relevance of the body parts of the Yadava community males in the estimation of their stature.*

S. No.	Measurements (cm)	Yadava Male (N=100)		
		Correlation coefficient (r)	Regression equation	P Value
1	Head Cir	0.127	Ht=153.144+(.224)head cir.	.045
2	NeckCir	0.190	Ht=150.540+(.424)neck cir.	.003
3	ChestCir	0.286	Ht=145.474+(.216)chest cir.	.000
4	AbdomenCir	0.389	Ht=142.962+(.256)abdomen cir.	.000
5	Waist Cir	0.312	Ht=147.221+(.204)waist cir.	.000
6	HipCir	0.329	Ht=144.643+(.225)hip cir.	.000
7	Upper arm Cir (Rt)	0.140	Ht=159.949+(.170)upper arm cir. Rt.	.027
8	Upper arm Cir (Lt)	0.138	Ht=160.036+(.168) upper arm cir. Lt.	.029
9	Condylar Cir(Rt)	0.093	Ht=161.374+(.141)condylar cir. Rt.	.144
10	Condylar Cir(Lt)	0.090	Ht=161.496+(.137) condylar cir. Lt.	.156
11	Wrist Cir(Rt)	0.221	Ht=150.351+(.830)wrist cir. Rt.	.000
12	Wrist Cir(Lt)	0.223	Ht=150.402+(.832) wrist cir. Lt.	.000
13	Thigh Cir(Rt)	0.095	Ht=161.138+(.080)thigh cir. Rt.	.134
14	Thigh Cir(Lt)	0.098	Ht=160.998+(.082)thigh cir. Lt.	.121
15	Knee Cir(Rt)	0.429	Ht=143.194+(.629)knee cir. Rt.	.000
16	Knee Cir(Lt)	0.428	Ht=143.290+(.628)knee cir. Lt.	.000
17	Calf Cir(Rt)	0.300	Ht=151.596+(.400)calf cir. Rt.	.000
18	Calf Cir(Lt)	0.301	Ht=151.627+(.400)calf cir. Lt.	.000
19	Weight (Kg)	0.444	Ht=150.087+(.238)weight	.000

* Significant at .05% level, *Cir.-Circumference, *Rt- Right, *Lt- Left

For each measurement, the levels of 't' and significance (p-value) are provided. According to the data, there are noticeable differences between the two communities' members in terms of their height, weight, condylar circumference, neck circumference, chest circumference, abdomen circumference, waist circumference, hip circumference, and calf circumference. However, there were no appreciable variations in the wrist and head circumference measurements. All measurements have a level of significance less than 0.05, showing that the differences are really statistically significant.

- **Description of MFs Table**

Linear Regression Equation for Estimation of Stature using other Anthropometric measurements for Yadava Male Community of Lucknow, Uttar Pradesh

Table 8: *Distribution Multiplication Factors from the various circumference of the body among Brahmin (Male and Female) Community of Lucknow, Uttar Pradesh*

* Cir.-Circumference, *Rt- Right, *Lt- Left

Table 9: *Distribution Multiplication Factors from the various circumference of the body among Yadava (Male and Female) Community of Lucknow, Uttar Pradesh*

S. No.	Measurements (cm)	Multiplication Factors of Brahmin Community	
		Male (N=250)	Female (N=250)
1	Head Cir	3.20	3.01
2	Neck Cir	5.00	4.77
3	Chest Cir	1.78	1.68
4	Abdomen Cir	1.84	1.75
5	Waist Cir	1.81	1.71
6	Hip Cir	1.76	1.64
7	Upper arm Cir (Rt)	4.85	4.60
8	Upper arm Cir (Lt)	4.87	4.61
9	Condylar Cir(Rt)	5.79	5.86
10	Condylar Cir(Lt)	5.82	5.89
11	Wrist Cir(Rt)	9.68	9.28
12	Wrist Cir(Lt)	9.75	9.35
13	Thigh Cir(Rt)	2.95	2.81
14	Thigh Cir(Lt)	2.95	2.82
15	Knee Cir(Rt)	4.30	4.39
16	Knee Cir(Lt)	4.31	4.40
17	Calf Cir(Rt)	4.47	4.51
18	Calf Cir(Lt)	4.48	4.53
19	Weight (Kg)	2.66	2.75

* Cir.-Circumference, *Rt- Right, *Lt- Left

Tables 8 and 9 display multiplication factors for body dimensions with weight among male and female Brahmin and Yadava communities of Lucknow, Uttar Pradesh. Differences in body proportions lead to varying multiplication factors. Brahmin males have higher multiplication factors for most dimensions, except for four, while Brahmin females have higher factors for only four

S. No.	Measurements (cm)	Multiplication Factors of Yadava Community	
		Male (N=250)	Female (N=250)
1	Head Cir	3.07	2.91
2	Neck Cir	4.78	4.76
3	Chest Cir	1.81	1.67
4	Abdomen Cir	1.90	1.77
5	Waist Cir	1.87	1.74
6	Hip Cir	1.81	1.68
7	Upper arm Cir (Rt)	5.35	5.54
8	Upper arm Cir (Lt)	5.37	5.57
9	Condylar Cir(Rt)	6.11	6.27
10	Condylar Cir(Lt)	6.14	6.30
11	Wrist Cir(Rt)	9.24	9.00
12	Wrist Cir(Lt)	9.30	9.07
13	Thigh Cir(Rt)	3.24	3.19
14	Thigh Cir(Lt)	3.25	3.20
15	Knee Cir(Rt)	4.72	4.43
16	Knee Cir(Lt)	4.73	4.45
17	Calf Cir(Rt)	4.86	4.60
18	Calf Cir(Lt)	4.88	4.62
19	Weight (Kg)	2.61	2.84

dimensions. The difference in multiplication factors between Brahmin males and females ranges from 0.1 to 0.26.

VI. DISCUSSION

The study compared the stature estimation from different body parts among Brahmin and Yadava populations in Lucknow. The results revealed that the Brahmin males had a higher mean height, weight, and circumferences of different body parts compared to Yadava males. Similarly, Brahmin females also had higher mean values for these measurements compared to Yadava females. Moreover, the data presented in the tables can be used as a reference for future studies on these populations.

The average height of Brahmin men was 168.43 cm, with a standard deviation of 6.99 cm and a standard error of 0.442 cm, according to the study's analysis of the gender distribution of Brahmin men and women. While Brahmin women's average height was 157.34 cm, their standard deviation was 6.30 cm, and their standard error was 0.398 cm. The average weight, head circumference, neck circumference, chest circumference, abdomen circumference, waist circumference, hip circumference, upper arm circumference, condylar circumference, wrist circumference, thigh circumference, knee circumference, and calf circumference were all higher in Brahmin men than in Brahmin women.

VII. FUTURE WORK

The study shed light on the variations in anthropometric measurements between the Lucknow populations of Brahmin and Yadava. Additionally, it provided thorough details on the average and range of different body measurements for Brahmin males and females separately [15]. The study's generalizability to other populations was constrained by its limited sample size and concentration on just

two populations in a particular area. Further research with larger sample sizes and broader population representation is needed for more conclusive results.

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