

# Correlation of Stature and Head Circumference in Uttar Pradesh Population

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## Abstract

**Background:** Anthropometry is the measurement of different parameters of any human individual. Anthropometry was first developed in 19<sup>th</sup> century. It was introduced by French police officer Alphonse Bertillon in 1883. Anthropometric measurements are important for identifying unknown bodies. The objectives is to the aim of present study is measuring head circumference and stature and their correlation so that a conclusion can be drawn about the correlation between these two parameters. **Subjects and Methods:** The study was conducted in the department of Anatomy, IIMS&R, Integral University, Lucknow. The present study group was done on 400 healthy individuals between 18-30 years of age (200 males & 200 females) of Uttar Pradesh population. Measurement of head circumference and stature was done and then stature was correlated with the head circumference. Written consent was taken before the assessment. This study was ethically approved by IIMS& R Institute research and ethical committee. Data was statistically analyzed. **Results and Conclusions:** In present study it was found that measurements of both the parameters (head circumference and stature) was higher in males in comparison to females. There was positive correlation between stature and head circumference.

**Keywords:** Anthropometry, Stature, Head circumference, Correlation

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## Introduction

Anthropometry is a sequence of systematized measuring methods that quantitatively express the size of human body and skeleton. Anthropometry is often viewed as a traditional and perhaps the fundamental instrument of biological anthropology and it has enhanced use in medical sciences, particularly in the field of forensic medicine. The significance and importance of somatometry, cephalometry, craniometry and osteometry in the detection of human remains has been defined a new word of forensic anthropology. The ultimate goal of using anthropometry in forensic medicine to achieve personal identity in unidentified human remains. [1] The anthropometric measurements are significant instruments for the comparison of the proportion between body segment with age, gender and ethnicity dependents. [2]

Anthropometry was first developed in 19<sup>th</sup> century. [3] It was introduced by French police officer Alphonse Bertillon

in 1883. Positive human identification is an significant job conducted by forensic scientists through their particular scientific technique called Fatality Incident Management, situations such as mudslides, typhoon, earthquakes, building collapse, bomb blast, train accident etc. [4]

Stature determination means measurement of person body height. Many researchers have accomplished reconstruction of the stature from different bones of the human skeleton with different degree of precision. It is important in establishing identity in case of unknown dismembered remains. [5]

Most of the time stature is measured by the help of long bones as compare to flat bones. In present study stature is correlated with head circumference in Uttar Pradesh population so that conclusion can be drawn about the correlation between these two parameters.

## Subjects and Methods

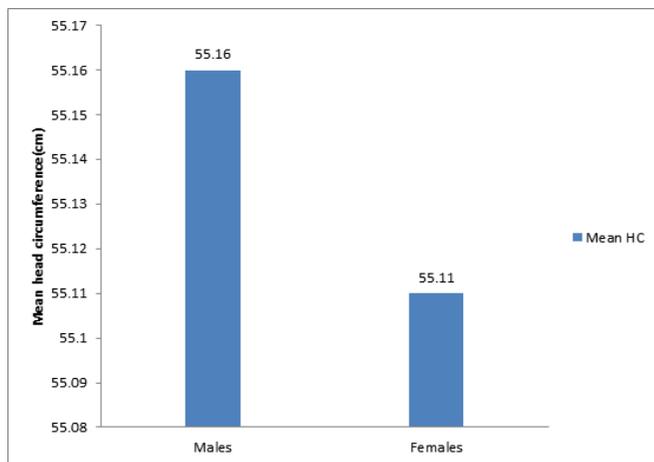
The study was conducted in the department of Anatomy, IIMS&R, Integral University, Lucknow. The study group was comprised of 400 healthy individuals between 18-30 years of age (200 males & 200 females) who were randomly selected from population of Uttar Pradesh. Measurement of head circumference and stature was done and then stature was correlated with the head circumference.

Subject were standing barefoot in anatomical position. Head was in Frankfurt horizontal plane. Stature was measured with the help of stadiometer from the vertex to heel in mid sagittal plane .

Head circumference was measured with the help of non stretchable measuring tape. Subject was sitting in a chair in a relaxed condition with the head in anatomical position. Measurement was taken by placing the tape at the level of the occipital protuberance and supraorbital ridges.

Written consent was taken before the assessment. This study was ethically approved by IIMS& R Institute research and ethical committee. All data was tabulated and statistically analyzed.

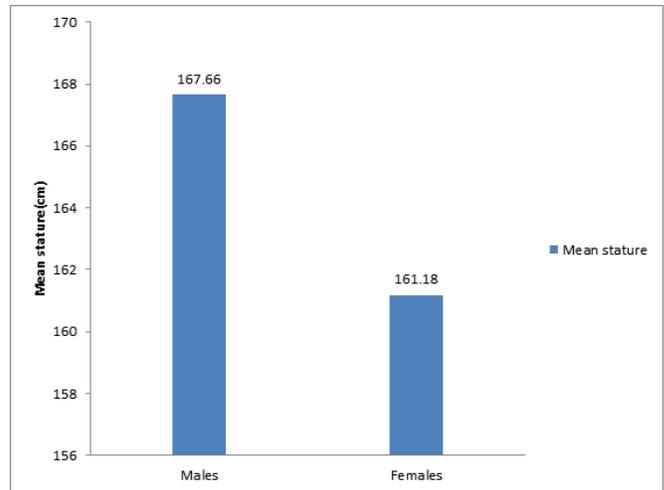
## Results



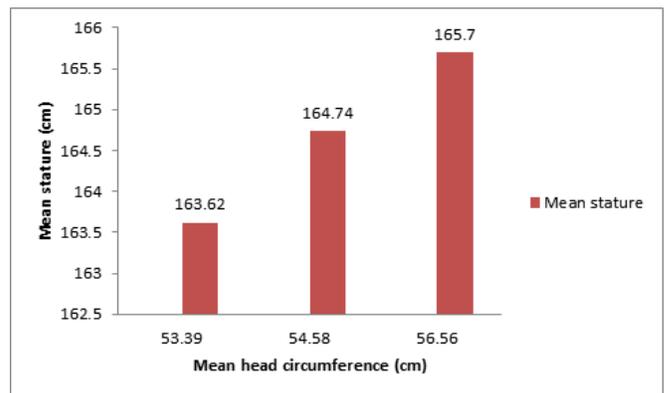
**Figure 1: Gender wise distribution of head circumference**

In [Table 1] Mean head circumference for male population is found to be 55.1cm while in female population mean head circumference is 55.11cm. The difference was highly significant ( $p < 0.0001$ ). On comparison of male population with female population, higher value of head circumference is observed in male population [Figure 3].

In [Table 2] Mean stature for male population is found to be 167.66cm while in female population mean stature is



**Figure 2: Gender wise distribution of stature**



**Figure 3: Correlation between stature and head circumference of total population.**

161.18cm. The difference is highly significant ( $p < 0.0001$ ). On comparison of male population with female population higher stature is observed in male population [Figure 4].

In [Table 3] Total population divided into three group. In first group mean head circumference is 53.39 cm while mean stature is 163.62 cm. There was positive correlation between head circumference and stature. This difference is found significant ( $< 0.0001$ ). In second group mean head circumference is 54.58 cm while mean stature is 164.74 cm. There was positive correlation between head circumference and stature. This difference is found significant ( $< 0.0001$ ). In third group mean head circumference is 56.56 cm while mean stature is 165.70 cm. There is positive correlation between head circumference and stature [Figure 3]. This difference is found significant ( $< 0.0001$ ).

**Table 1: Gender wise distribution of head circumference**

Population	N%	Range of head circumference(cm)	Mean head circumference $\pm$ SD	P-Value
Male	200 (50%)	50.90-59.99	55.16 $\pm$ 1.70	<0.0001
Female	200 (50%)	50.90-58.42	55.11 $\pm$ 1.70	<0.0001

**Table 2: Gender wise distribution of stature**

Population	N%	Range of stature(cm)	Mean stature $\pm$ SD	P-Value
Male	200 (50%)	157.48-180.32	167.66 $\pm$ 7.03	<0.0001
Female	200 (50%)	139.7-167.64	161.18 $\pm$ 4.34	<0.0001

**Table 3: Head circumference in total population**

Head circumference of total population								
Total	N (%)	Range of head circumference (cm)	Mean head circumference (cm) $\pm$ SD	Range of stature (cm)	Mean stature (cm)	R-Value	P-Value	
400	133 (33.33%)	50.90- 54	53.39 $\pm$ 0.93	134.62-180.34	163.62 $\pm$ 6.14	0.43	<0.0001	
	133 (33.33%)	55-55.93	54.58 $\pm$ 0.43	142.24-180.34	164.74 $\pm$ 7.01	0.38	<0.0001	
	134 (33.34%)	55.94-59.99	56.56 $\pm$ 1.42	147.32-180.34	165.70 $\pm$ 6.75	0.25	<0.0001	

**Table 4: Comparison with other studies**

Author	Population	Sample size	Head circumference		Stature		
			Male	Female	Male	Female	
Srestha al(2009), [6]	et Rais Nepal	111	111	-	-	160.4	151.8
Zhi-Jing al(2009), [7]	et Han Chinese	56	63	57.49	56.25	-	-
Agnihotri al(2011), [8]	et Indo- Mauritian	75	75	56.79	54.78	173.40	157.36
Esomonu al(2013), [5]	et Bekwara (Nigeria)	50	50	55.38	54.62	157.3	155.7
Lukapata al(2015), [2]	et Ogoja (Nigeria)	150	150	55.3	54.6	157.3	155.6
Dennis al(2017), [9]	et Nigeria	444	444	55.12	54.72	168.62	163.82
Marko al(2018), [10]	et Indore(M.P)	100	100	55.35	54.33	171.59	157.48
Obej al(2019), [11]	et Idoma (Nigeria)	155	145	-	-	174.38	156.35
Present study	Uttar Pradesh	200	200	55.16	55.11	167.66	161.18

## Discussion

Other authors also found all measurements higher in male

The present study shows that all measurements have higher

population as compared to female population. [Table 4]

In the present study, the mean value of head circumference in male is 55.16 cm and female is 55.11cm. The mean head circumference value is more in male population as compared to female population. Dennis et al, 2017,<sup>[9]</sup> observed mean head circumference in males was 55.1cm and females was 54.1 cm. Dennis et al found mean head circumference value approximately closer to mean head circumference in our present study.

In present study, the mean stature in male population is 167.66cm and female population is 161.18cm. Dennis et al, 2017,<sup>[9]</sup> observed mean stature in males was 168.62cm and females was 163.82cm. Dennis et al found mean stature value approximately closer to mean stature value in our present study.

Only few studies correlated head circumference with stature. Esomonu et al, 2013,<sup>[5]</sup> observed positive correlation coefficient between stature and head circumference( $r = 0.49$ ).

Agnihotri et al (2011),<sup>[8]</sup> observed positive correlation between stature and head circumference ( $r = 0.45$ ).

## Conclusion

The objective of the present study conducted on 400 population of Uttar Pradesh on both gender, with aim to create database result on head circumference, stature and to determine the correlation between stature and head circumference. Study showed significant difference.

- Males had higher values of head circumference and stature compared to females.
- There was positive correlation between head circumference and stature in total population.

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