

## **Relationship between height and head circumference in Kashmiri Population.**

**Zarka Khursheed<sup>1</sup>, Mohd Saleem Itoo<sup>2</sup>, Zeeshan Iqbal<sup>3</sup>, Ghulam Mohammad Bhat<sup>4</sup>**

1. Postgraduate scholar, Department of Anatomy, GMC Srinagar
2. Professor, Department of Anatomy, GMC Srinagar
3. Postgraduate scholar, Department of Anatomy, GMC Srinagar
4. Professor and Head, Department of Anatomy, GMC Srinagar

**Corresponding Author: - Zarka Khursheed**

**Corresponding Address: - GMC Srinagar**

### **ABSTRACT**

**BACKGROUND:** - The correlation between height and head circumference has been the subject of numerous studies, with researchers aiming to understand how these two measurements relate to each other throughout different stages of life.

**AIM AND OBJECTIVES:** - To study the relationship of human height with human head circumference

**MATERIAL AND METHODS:** - The present study was carried out in Government Medical College Srinagar for a period of three months from January 2024 to March 2024. One hundred (50 males; 50 females) healthy individuals between 18-36 years of age and of Indian origin were randomly selected for this study.

**RESULTS:** - The mean height of males observed was  $172.01 \pm 7.46$  cm. The mean height of females observed was  $160.30 \pm 5.23$  cm. It was observed that height of males was more than the height of females. The mean value of head circumference in males observed was  $56.83 \pm 2.16$  cm. The mean value of head circumference in females observed was  $54.90 \pm 10.38$  cm. It was also observed that there is positive correlation between height and head circumference and this correlation was found statistically significant.

**CONCLUSION:** - Our study showed that there is positive correlation between height and head circumference and this correlation was found statistically significant.

**KEYWORDS:** - height, head circumference, correlation, anthropometry.

## 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<sup>1</sup>. The significance and importance of somatometry, cephalometry, craniometry and osteometry in the detection of human remains has been defined a new word of forensic anthropometry. The ultimate goal of using anthropometry in forensic medicine to achieve personal identity in unidentified human remains. The anthropometric measurements are significant instruments for the comparison of the proportion between body segment with age, gender and ethnicity dependents<sup>2</sup>. Anthropometry was first developed in 19th century<sup>3</sup>. It was introduced by French police officer Alphonse Bertillion Academia Anatomica International Volume6 Issue 2 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<sup>4</sup>

Height, also known as stature, refers to the distance from the bottom of the feet to the top of the head in a human body when standing erect. It is typically measured using a stadiometer. In the metric system (SI units), height is expressed in centimetres. Genetics significantly influence an individual's height, although environmental factors also play a role. While no single "height gene" exists, variations in several genes contribute to an individual's height potential. Additionally, average height within a population can be indicative of overall health and well-being.

Head circumference, also known as occipitofrontal circumference (OFC), refers to the maximum circumference of the head<sup>5</sup>. It is traditionally measured from just above the glabella area (the space between the eyebrows) to the area near the top of the occipital bone (opisthocranium) at the back of the head. The OFC is an important measurement in clinical genetics and child development assessment. The largest head circumference is obtained by measuring with a tape from the glabella to the opisthocranium. It can be compared to age- and gender-specific norms to assess growth. Over time, monitoring OFC helps identify unusual

increases or inadequate growth. In certain syndromes, head circumference can be characteristically small or large.

The relationship between height and head circumference is a subject of considerable interest in various scientific fields, including anthropology, medicine, and forensic science. This relationship is often explored to understand human growth patterns, diagnose medical conditions, and even assist in forensic investigations. The study of these measurements, known as anthropometry, provides valuable insights into the genetic and environmental factors that influence physical development.

The correlation between height and head circumference has been the subject of numerous studies, with researchers aiming to understand how these two measurements relate to each other throughout different stages of life. In infants and children, a strong correlation is often observed, as rapid growth in both height and head circumference occurs simultaneously. However, as individuals reach adulthood, the relationship may become less pronounced, with height continuing to increase at a slower rate while head circumference remains relatively stable.

In forensic science, the relationship between height and head circumference can be particularly useful. Forensic anthropologists often rely on such correlations to estimate stature from skeletal remains when only the skull is available. This can be crucial in identifying unknown individuals in criminal cases or mass disasters.

Moreover, understanding the relationship between these two measurements can also have implications for public health. For instance, if a significant correlation is found within a population, it could inform strategies for early detection of growth abnormalities or developmental disorders. Additionally, it can contribute to the creation of more accurate ergonomic designs in various industries, improving safety and comfort.

This paper aims to delve into the existing literature along with analysing data from Indian population on the relationship between height and head circumference and by doing so provide a comprehensive overview of how these two measurements interact as well as its applications in clinical and forensic settings.

## **MATERIAL AND METHODS**

The present study was carried out in Government Medical College Srinagar for a period of three months from January 2024 to March 2024. One hundred (50 males; 50 females) healthy individuals between 18-36 years of age and of Indian origin were randomly selected for this study.

Individuals with congenital or acquired deformities were intentionally excluded from this study. Prior to data collection, informed consent was obtained from each participant. A comprehensive medical history was documented, and a thorough clinical examination was conducted to rule out any underlying diseases or deformities that might have influenced overall growth.

The anthropometric measurements of interest were height and head circumference. Height was assessed using a standard stadiometer, with participants standing in a typical upright position. The head was oriented in the ear-eye plane (also known as the Frankfort horizontal plane), extending from the standing surface to the highest point on the vertex. Participants were barefoot during height measurements.

For head circumference, a measuring tape was placed around the widest part of the head, just above the ears, ensuring that it nearly touched the earlobes and aligned with the forehead. To minimize measurement variability, all readings were recorded twice, and the mean value was used for analysis. This rigorous approach aimed to reduce subjective errors and enhance the reliability of our findings.

## **STATISTICAL METHODS**

The recorded data was compiled and entered in a spread sheet (Microsoft excel) and then exported to data editor of SPSS version 25.0. Karl Pearson's correlation coefficient (r value) was applied to determine the correlation of height with head circumference (HC). P value <0.05 has been considered as statistically significant

## **RESULTS**

A total of one hundred (50 males; 50 females) healthy individuals between 18-36 years of age and of Indian origin were randomly selected for this study. The mean values, standard deviation and standard errors are shown in Table 1. The mean height of males observed was  $172.01 \pm 7.46$  cm. The mean height of females observed was  $160.30 \pm 5.23$  cm. It was observed that height of males was more

than the height of females. The mean value of head circumference in males observed was  $56.83 \pm 2.16$  cm. The mean value of head circumference in females observed was  $54.90 \pm 10.38$  cm.

TABLE 1: Group Statistics					
PARAMETERS	GENDER	N	Mean	Std. Deviation	Std. Error Mean
HEAD CIRCUMFERENCE	MALE	50	56.83	2.16	.305
	FEMALE	50	54.90	10.38	1.46
HEIGHT	MALE	50	172.01	7.46	1.05
	FEMALE	50	160.30	5.23	.740

In table 2, we have calculated correlation between the height and head circumference using karl pearson's correlation coefficient. It is observed that there is positive correlation between height and head circumference and this correlation was found statistically significant.

Table 2: Correlations OF HEIGHT with head circumference		
PARAMETERS	HEAD CIRCUMFERENCE	
HEIGHT	Pearson Correlation(r)	0.41
	P value	0.03*
	N	100
*significant at p value < 0.05		

## DISCUSSION

The present study shows that all measurements have higher value in male population as compared to female population. Other authors also found all measurements higher in male as compared to female population as shown in Table 3.

In the present study, the mean value of head circumference in male is 56.8 cm and female is 54.9cm. The mean head circumference value is more in male

population as compared to female population. Dennis et al, 2017 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 172.01 cm and female population is 160.03 cm. Dennis et al<sup>9</sup>, 2017 observed mean stature in males was 168.62cm and females was 163.82cm. Dennis et al<sup>9</sup> found mean stature value approximately closer to mean stature value in our present study. Only few studies correlated head circumference with stature.

Author	Population	Sample size		Head circumference		Stature	
		Male	Female	Male	Female	Male	Female
Srestha et al(2009) <sup>6</sup>	Rais Nepal	111	111	-	-	160.4	151.8
Zhi-Jing et al(2009) <sup>7</sup>	Han Chinese	56	63	57.4	56.2	-	-
Agnihotri et al(2011) <sup>8</sup>	Indo-Mauritians	75	75	56.7	54.7	173.40	157.36
Esomonu et al(2013) <sup>13</sup> ,	Bekwara (Nigeria)	50	50	55.3	54.6	157.3	155.7
Lukapata et al(2015) <sup>2</sup> ,	Ogoja (Nigeria)	150	150	55.3	54.6	157.3	155.6
Dennis et al(2017) <sup>9</sup> ,	Nigeria	444	444	55.1	54.7	168.62	163.82
Marko al(2018) <sup>10</sup> ,	Indore(M.P)	100	100	55.3	54.3	171.59	157.48
Obej et al(2019) <sup>11</sup> ,	Idoma (Nigeria)	155	145	-	-	174.38	156.35
Ekta et al (2023) <sup>12</sup>	Uttar Pradesh	200	200	55.1	55.1	167.66	161.18
Present Study	Jammu and Kashmir	50	50	56.8	54.9	172.01	160.03

Esomonu et al<sup>13</sup>, 2013, 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 ( $r = 0.45$ ). both studies were in accordance with our study as our study also showed positive correlation between the height and head circumference with  $r = 0.41$ .

## CONCLUSION: -

The present study concluded that head circumference has positive relationship with height of an individuals in Kashmiri population. But the gender differences doesnot showed much

relation between height and head circumference. Therefore height of individual can be estimated from head circumference. These type of studies help to study medico-legal cases in identification of an individual.

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