Correlation of Stature with Head Circumference of Male Adults of Upper Punjab

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Abstract

Objective: This study aimed to find how head circumference and stature related to males in Upper Punjab between the ages of 21 and 30.

Material and Method: The investigation was conducted using a quantitative methodology. The 382 adult male residents of Kharian City provided the data. The program SPSS 25 was used to conduct the analysis.

Results: The average stature, as determined by descriptive data, was 170.4 cm. 56.45 cm was the average head circumference. The height and head circumference have a 0.518 Pearson correlation. The value of r shows a statistically significant positive correlation. After the regression analysis was completed, the regression equation was used to label the regression curve.

Conclusion: The results of this investigation showed a correlation between head circumference and stature. Measuring head circumference will help forensic experts determine stature, especially when only the head is exposed due to a natural or artificial calamity.

Keywords: Correlation, anthropology, head circumference, stature, measurement

Introduction

A bone examination can be used to identify a human corpse during an autopsy examination. In forensics, bones are valuable. Following a natural disaster, morphometric analysis of the bone remains can provide information about the person they belong to.[1] Forensic pathologists and anthropologists must recognize age, sex, and race as essential identifying characteristics.[2] Since there is a proportionate biological relationship between stature and every region of the human body, particularly the head, face, trunk, and extremities, estimating stature is also crucial in forensic investigations.[3]

The development of quick and straightforward identification techniques is essential since mass deaths from natural disasters frequently call for them. As predicted, a study in China revealed that natural catastrophes harm people's mental and physical health, in addition to decreasing rural households' income[4]. Postponing the identification of their loved ones' remains will only make the survivors' mental suffering worse.

The two main ways used to evaluate height are mathematical and anatomical. The second approach estimates height using a regression equation or a multiplication factor[5]. Researchers have discovered a connection between measurements of different bodily components and stature by using their developed linear regression equations. Numerous studies have demonstrated a relationship between height and dimensions of the upper limbs, such as the arm, finger, forearm, and phalanges.[6]

The length and width of various body parts have long been used for a variety of reasons. The dimensions of the skull that are most frequently measured are its circumference, height, and length. Cranial length is measured as the separation between the posterior-most point in the sagittal plane and the ridge between the eyebrows. The head circumference is measured above the ears,

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in the middle of the forehead.[7] In recent years, it has been evident that head circumference and stature positively correlate.[8] The measurement of an individual's height is determined by extending from the apex of the head to the lowest point of the foot. Height is the most extensively researched attribute due to its low level of exertion, cost-effectiveness, and ease of quantification. Measuring someone's height can provide essential details about their health and the financial situation of both parties[9]. Many methods have been used to measure stature. The tool that physicians and researchers utilize the most is the stadiometer[10]. Since both innate and environmental factors play a significant role in height growth, many studies have been conducted globally to develop their regression equations. Since the location affects the ecological conditions differently. As a result, no one regression equation can be used for every circumstance[11]. Every country needs its regression equations[12]. This study aimed to develop a regression equation using head circumference as a predictor to estimate the height of men in the population under study. There has been no previous study done in this area.

Materials and Methods

This study was conducted at CMH Kharian Medical College. The study design used was descriptive cross-sectional. Men in Kharian City, ages 21 to 30, participated in the study. Sample size for correlation was generated using Power Analysis and Sample Size Software (PASS) version 11.013. Sample size was calculated to be 382. A non-probability sampling technique called purposive sampling was used. The height of a person was measured while standing upright in an anatomical position. The vertical distance from the vertex to the floor was used to determine it. One person took the measurements to prevent errors brought on by individual differences. Every measurement (in centimeters) was noted on a proforma. The head's largest circumference was measured by going above the opisthocranion and measuring from glabella to glabella. Only adult male attendants (aged 21–30) who accompanied patients to the CMH Hospital Kharian's outpatient department were selected for sampling. Their informed consent was acquired after presenting the subjects with a comprehensive explanation of the study's goals. The men with Dwarfism, Gigantism, Skeletal, Spine & Long bone deformities (acquired or congenital), persons with obvious head deformity and persons with surgical correction after injury to facial bones were excluded.

The data was analyzed using SPSS version 25.

Results

Using SPSS version 25, numerical analysis was applied to the acquired data. 170.4 cm was determined to be the mean height. A minimum of 148 cm height was required. The maximum height was 188 cm. There was a ±6.85 standard deviation. 56.45 cm was the average head circumference. 52.30 cm was the minimum and 61.50 cm maximum head circumference, respectively. ±1.69 is the standard deviation. Regression analysis equation: Height =51.98+ 2.10 × Head circumference.

The statistical measures provided P-value, Standard

Table 1: *Quantitatively, both head circumference and stature are recorded in centimeters.*

	Maximum	Minimum	SD	Mean
Standing height	188.00	148.00	6.85	170.4
Head Circumference	61.50	52.30	1.69	56.45

Table 2: *Quantitative explanations of the standard error of estimate, coefficient of determination, and Pearson coefficient*

	P value	SEE	R	R^2
Head Circumference	.000	5.86	0.518	0.269

Error of Estimate (SEE), Coefficient of Determination (R-squared), and Pearson Coefficient (R) offer insights into the regression analysis. The low P-value indicates statistical significance, supporting the applicability of the regression equation. Meanwhile, the SEE, R-squared, and R provide information on the accuracy of predictions and the strength of the relationship between variables. These measures collectively validate the findings and assess the regression model's fit to the data.

Table 3: *Statistical analysis of correlation between head circumference and regression coefficients.*

	B	Values of t	Std. Error	Sig
Head circumference	2.098	11.816	.178	0.01
(Constant)	51.98	5.18	10	0.02

Table No 3 presents the statistical analysis of the correlation between head circumference and regression coefficients. For head circumference, the coefficient B is 2.098, indicating the change in the dependent variable associated with a one-unit change in the independent variable. The associated t-value of 11.816 suggests that the coefficient is significantly different from zero.

The standard error is 0.178, and the significance level (Sig) is 0.01, further supporting the significance of the coefficient. Similarly, for the constant term, the coefficient is 51.98, with a t-value of 5.18 and a standard error of 10. The significance level is 0.02, indicating that the constant term is also statistically significant. These results collectively provide insights into the relationship between head circumference and the regression coefficients, confirming their significance in the analysis.

Regression Curve:
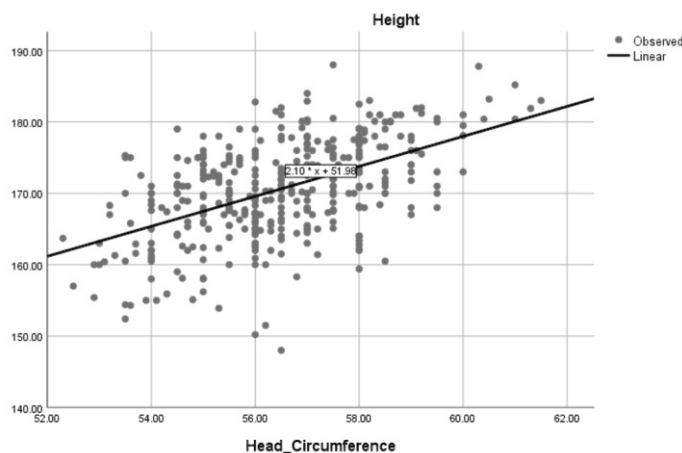
Fig-1. *The curve of regression model under consideration involves the dependent variable of height and the independent variable of head circumference.*

Discussion

These days, it is all too usual for people to perpetrate violent crimes, such as dismembering murder victims, suicide bombs, explosions, accidents, and earthquakes. Pakistan is included on the list of countries prone to natural catastrophes due to its diverse geography and climate. Forensic experts aim to identify human remains by anthropometric methods at disaster scenes accurately. In prosthetics, ergonomics, reconstructive surgery, and forensic medicine, anthropometric measures are predominantly employed to collect relevant data.

Measurements are conducted systematically and with meticulous attention to detail. The neck and head are the primary anatomical regions readily accessible or frequently exhibited for identification. These unidentifiable people frequently have "rounded" or changed facial features. When determining the identity of a suspect, one of the most crucial elements is their height. In many nations worldwide, anthropometric head measurements positively correlate with height, which can help determine personal identity and lower the number of likely victims. Because every country has a unique climate, traditions, and genetic composition, anthropometric measurements and regression models cannot be applied to the Pakistani region[14]. The objective of this study is to employ head circumference measurements as a means of determining the height of individuals belonging to the Kharian ethnic group. To identify unidentified, mutilated bodies, a regression equation for height estimate is devised.

In the current study, the average standing height of adult men was 170.4 cm. The study's samples range from 148 to 188 cm, from low to high. 6.85 cm was the average variation. An Islamabad research found that the average height of men was 170.5 cm, with an 8.06 centimeter variation[15]. Variations in average male stature can be attributed to various factors, including genetic variability within communities, environmental variables such as nutritional quality and accessibility to health care, socio-economic disparities, and differences in sampling procedures and research populations. Male average height was reported to be greater in another Peshawar survey, measuring 183.5 cm[16]. A study conducted in Romania revealed that the range of adult male height is between 154 and 194 cm.[17]

The average head circumference, according to the research, was 56.45 cm. The head circumference measurements ranged from 52.30 cm to 61.51 cm. 1.69 cm was determined to be the standard error. A significantly elevated p-value of 0.518 was observed in the present study, indicating a substantial association between height and head circumference. The connection is positive. Several additional studies have found similar positive correlations between these two measures. Males' head circumference was measured at 56.29cm, and their mean height was 170.45 cm in a survey done in Maharashtra, India. These two variables were found to have a correlation value of 0.36718. Research conducted in Gujarat, India, revealed a significant correlation of 0.575 between head circumference and height, as indicated by a statistically significant p-value[19]. The study conducted in India yielded a Pearson's coefficient value of 0.729[20]. The study conducted in Nigeria examined the r values across different ethnic groups, revealing a range of values from 0.21 to 0.29, 0.31 to 0.34, and 0.39[21]. According to a Karnataka study, head circumference and height were correlated by 0.494[22]. A correlation of 0.55 was found between head circumference and stature by Mohammed et al.[23] The r-value for the relationship between head circumference and height

was also 0.51024 in a Mumbai research study.

Conclusion

The results of this study will shed light on how to calculate height after a natural or man-made disaster in the same region that has left only an adult's head standing. Various domestic and international research projects will be compared using it as well. A regression equation that enhances justice could be developed with the help of this investigation.

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Authors Contribution
FB: Conceptualization of Project
FB, AS: Data Collection
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