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Intergonion Parametric Distance Changes Between the Garhwali and Terai Ethnic Groups of Dehradun, Uttarakhand, India

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ABSTRACT
In this study, an effort has been made to check the Intergonion parametric distance changes between the Garhwali and Terai ethnic groups of Dehradun, Uttarakhand, India. During this study period, 200 subjects, i.e, 100 males and 100 females from each ethnic group of Garhwali and Terai were taken. They were born and brought up in the Uttarakhand region. They were aged 20 years above up to 35 years old. They have been chosen for the reason that by this age, that there is fully completion of facial skeletal growth by ossification of other long bones of human body. Statistics show a significant relationship ($p<0.005$) in both genders of ethnic groups. In this study, the p-value was 0.041 in Garhwali females and 0.05 in Garhwali males. In case of both Garhwali genders, the p-value indicates that the result is approximately statistically significant. The p-value is 0.0005 in Terai females and 0.1 in Terai males. In the case of terai females, the p-value indicates that the result is statistically highly significant.

INTRODUCTION

Introduction. Anthropometric measurements are those that pertain to humans and consider various aspects of their physical characteristics, including size (such as height, weight, surface area and volume) and structure etc. These anthropometric measures have historically been used, to link physical attributes because outlined by matching antemortem illustrations and the deceased's skull as an identification technique. The arrangement of the bone and the soft tissue that covers it determines the form of the human face[1]. Medical specialties frequently employ quantitative measurements of the size and form of the face soft tissue for diagnosis, planning of the patient's course of treatment and postoperative evaluation[2]. The idea that missing people might be located by comparing antemortem photos with the deceased's skull as a method of identification was initially put out by Professor Brash in 1935[3,4]. It is influenced by a variety of variables, including heredity, age, gender, race and the environment[5-6]. The history of the Tharu tribes is quite complicated and according to some writings, they are Rajpoot-related and descended from people who resided in western India[7]. Facial anthropometry, a subfield of physical anthropology, is concerned with taking measurements of various body components[7]. Estimating body indices is done for bones or bone pieces for identification in archaeological operations or forensic exams following major catastrophes[8]. Although anthropologists and sociologists have differing views on the history of the Tharu tribes, they both agree that, based on blood type and facial features, the Tharu tribes are members of the Mongoloid race[9,10]. Therefore, the goal of the study was to assess the numerous anthropometric features of the face of adult members of the Terai and Garhwali Tribes in the district of Dehradun, Uttarakhand. According to the cephalic and facial index of the population of the relevant ethnic group, various forms of equipment, including masks, helmets, goggles, or those used for other purposes, such as headphones, must be defined in certain sizes and shapes[11]. External measurements and descriptions of the human body are the core topics in physical anthropology. Singh and Bhasin described the process for taking anthropometric measurements[12]. When using the superimposition technique to find a missing individual, variables like inter-pupillary distance and interzygomatic breadth/facial width of the human face is taken into consideration[13]. As dimorphic abomination tools, the bizygomatic distance and maxillary sinus width are employed[14]. The generation of the picture in the panoramic radiograph was unaffected by the intergonionic distance[15]. An investigation of the fundamental and derived anthropometric indices among the healthy adults of the Raji Tribe in Uttarakhand, India[16]. Anthropometric measures were taken from Singh IR and Bhasin MK in 1968, who also studied the genetics of Indian castes and tribes[17]. In order to create a digital human model, anthropometric data-measurements of a person's size and shape are often employed. Singla M, Goel P, Ghai R, Khare S, Jain P. conducted research on the facial index in adult Indian Punjabi men, Jat Sikhs and Banias[18]. In the region of Uttarakhand, Sharma N and Ali S. compare the variations in the interzygomatic distance between the Kumaoni and Terai ethnic groups[19].

Aim: In this study, the main aim was to check the variation in Intergonion distance between Garhwali and Terai ethnic groups of dehradun uttarakhand region India.

The objectives: In this study, It is observe the Intergonion distance in the uttarakhand ethnic group of Garhwali and Terai, with the help of an anthropometric tool along with statistical analysis.

Inclusion criteria: The age selected which is not less than 20 years and not more than 35 years and also their parents belong to the Kumauni and Garhwali Tribe of uttarakhand since birth. Apparently and healthy individuals with no visible signs of facial and bony abnormalities were included in the study.

Exclusion criteria: The individuals of Kumauni and Garhwali Tribe other than Uttarakhand were excluded from the study. The research excludes those with endocrine diseases including dwarfism or gigantism as well as those who have craniofacial dismorphologies as a result of orthodontic procedures, severe face injuries, or craniofacial trauma.

MATERIAL AND METHODS

In the Anatomy Department, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, This present study were all involved in its execution. Due to the full growth and stabilization of the bones at these age ranges 21-35 years are used for the analysis. About two hundred living participants were taken. People from Garhwali and Terai localities were asked to provide a selection of their facial linear distances, angles, volumes and areas.

Methodology: In this present study there were use of professional anthropometric tools; the stanley steel measuring tape and digital sliding machines for measure of upper face length, lower facial length and total facial length to the closest unit in millimeters

Fig. 1: This is a figure of Garhwali female showing intergonion distance in the study

Fig. 3: This is a figure of Terai female showing intergonion distance in the study

Fig. 2: This is a figure of Garhwali male showing intergonion distance in the study

Fig. 4: This is a figure of Terai male showing intergonion distance in the study

(mm). The precise facial bony landamrks were measured by taking point known as Gonion. The Appropriate ethnic groupings of subject measurements are shown in the Fig. 1-4.

Anthropometric measurement: The Intergonion distance. Depending on sex hormones, facial indices are sexually dimorphic[20]. Corresponding ethnic group the following figures represent the subject measurements (Fig. 1-4).

The present study's Garhwali females have wide intergonion distance . Face of these Garhwali females having somewhat short length. It means their face are wider and broader. The image of Garhwali female is given below, in Fig. 1.

The present study's Garhwali males have wide intergonion distance. Face of these Garhwali females having somewhat short length. It means their face are wider and broader. The image of Garhwali male is given below, in Fig. 2.

The present study's Terai females have wide intergonion distance . Face of these Garhwali females having somewhat short length. It means their face are wider and broader. The image of Terai female is given below, in Fig. 3.

The present study's Terai males have wide intergonion distance . Face of these Garhwali females having somewhat short length. It means their face are wider and broader. The image of Terai male is given below, in Fig. 4.

Statistical analysis: An Excel spreadsheet is used to tabulate, consolidate and organize the measurements and data that have been gathered. The dimensions of the face are averaged, ranged and correlated to determine their mean, range and standard deviation. Use of SPSS 24.0 is used for statistical analysis. At P 0.05, or a 95% confidence interval, the level of statistical significance is established. Table 1, Comparison of Intergonion Distance by Gender Based on Mean, Range and Standard Deviations of Each Ethnic Group.

RESULTS

In Table 2 below, the average mean and standard deviation of Intergonion length for Garhwali male is (96.81±8.81), which is greater. In Garhwali females the average means and standard deviation is 95.95±8.24. In Table 3, average intergonion lengths for terai males are 89.04±10.4 and for terai females it is 89.86±7.17. Regression in Table 2 is 1.25 in Garhwali males and in Garhwali females 1.16, which shows showed a weak positive correlation (Pearson's r = 0.1) and the p-value in both Garhwali males 0.09 are found to be more than the level of Significance 0.05, which is nonsignificant. Garhwali females, the Regression are 0.27, which is again non significant.

In Table 3, the terai males the standard error is 1.48 and in terai females it is 1.01, which gain shows weak correlation. Terai males have regression about 0.26, showing weak significant. Terai female also showing 0.002 significant values. In the case of terai males, the p-value is less than 0.05, which indicates that the correlation is much higher than the threshold value, so the result is statistically significant in both ethnic group's p-values.

DISCUSSION

In this present study the male Garhwali were observed to have a greater average or mean intervention distance than female Garhwali. Variations in the current study's findings can be attributed to variables like the study's tiny sample size, its focus on particular ethnicities and age restrictions. A weak association between Intergonion Distance and the number of subjects was found in my current research for both Garhwali men (2.32/se) and girls (0.96/se) for Garhwali tribe. The degree of significance for Terai males' p-value was determined to be lower than that for Terai females' (0.1/regression equation (SE/ 0.79 standard error), which was 0.0005/regression equation (SE/ 1.26 standard error). Based on Intergonion distance, there has been very little to no research on the two ethnic groups of the Garhwali and Terai, i.e., there has been no comparison with any other author's work. However, more thorough research is still needed to evaluate their application to skeletal remains. Based on Intergonion distance, it is necessary to investigate these variables in these two ethnic groups, the Terai

Table 1: Thisis a table showing comparison of Intergonion distance in relation to gender showing mean, range and sd from each ethnic groups

Gender	Parameter	Mea n (mm)	SD (Standard deviation)	Range
Garhwali males	Intergonion Distance	97.65	16.42	15.46 to 117.35
Garhwali females	Intergonion Distance	85.49	6.81	74.67 to 99.24
Terai males	Intergonion Distance	93.01	8.91	80.35 to 114.8
Terai females	Intergonion Distance	96.12	5.64	86.46 to 104.47

SD: Standard deviation, R: range, mm: millimeter

Table 2: This is a table showing description of statistics for Gurkha ethnic groups

Sex	Variable	Mean	SD	se	ci	r	p-value
Garhwali males	Intergonuion distance	97.65	16.42	2.32	99.95±5.90	0.16	0.05
Garhwali females	Intergonuion distance	85.49	6.81	0.96	87.07±3.27	0.07	0.04

SD: Standard deviation, se: Standard error, ci: Confidence interval, r: Coefficient, p: Significant value

Table 3: Thisis a table showing description of statistics for Terai ethnic groups

Sex	Variable	Mean	SD	se	ci	r	p-value
Terai males	Intergonuion Distance	93.01	8.91	1.26	94.41±8.45	0.09	0.1
Terai females	Intergonuion Distance	96.12	5.64	0.79	95.14±3.70	0.05	0.0005

SD: Standard deviation, se: Standard error, ci: Confidence interval, r: Coefficient, p: Significant value

Table 4: This is a table showing Comparison of different Parameters with different studies in relation to Ethnic groups

Authors	Parameter	Difference across gender
Kumauni males[19]	Interzygomatic distance	Non significant
Kumauni females[19]	Interzygomatic distance	Non significant
Terai males[19]	Interzygomatic distance	Non significant
Terai females[19]	Interzygomatic distance	Significant
Jaunsari Tribe- Uttarakhand[19]	Cephalic Index	Significant
Jaunsari Tribe Uttarakhand[19]	Nasal Index	Significant
Jaunsari Tribe Uttarakhand	Morphological- facial index	Significant
A Study on Garhwali and Jaunsari subjects[25]	Distance between rhenion to zygion (mm)	Significant
Males and females of Tharu[26]	BMI	Significant
Adult Tharu Population[26]	Nutritional Status	Significant
Present Study on Garhwali and Terai male-female subjects	Intergonion Distance	Significant

and Garhwali. Table 4, Comparison of Intergonion Distance and Other Facial Parameters with Different Studies in Relation to Gender[21-23]. The variation in the significant values in our study may be caused by additional variables, such as various tropic regions, the environment, culture, way of life, biology, etc. A study on facial aging done by Rebecca Fitzgerald *et al*.[24]. Study on Garhwali and Jaunsari peoples for observing distance from rhenion to zygion, done on 2022[25]. Another study on Body Mass Index and Chronic Energy Deficiency among Adults of Tharu Population, done on 2015[26].

CONCLUSION

Using genetic and anthropometric data, researchers might able to identify patterns in the facial features of different ethnic groups in Uttarakhand and how they have evolved over time. This information can help predict how these intergonionic features may continue to change and adapt in the future, as well as inform health and medical interventions specific to different populations. The study highlights the importance of understanding the genetic and evolutionary factors that dictate physical characteristics and emphasizes the need for culturally sensitive and inclusive research practices. The intervention may be the right characteristic for identifying the Gurkha and Terai ethnic groups, according to the current study's findings. The statistical information from the current study indicates that intergonion distance is the appropriate parameter for facial identification in Garhwali and Terai ethnic groups of Uttarakhand region in India. This study also may be used as a resource for authors of further studies on the mountainous ethnic groups of Uttarakhand.

Limitation:

- Representation of a regional population to prevent generalisation
- The evaluation of face characteristics
- Place special emphasis on the Garhwali and Terai tribes alone

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