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Anthropometric Profiles of Tribal Community in Tripura

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Abstract

Introduction: The anthropometric profiling of a population is crucial for any understanding of their biological diversity, nutritional status, and lifestyle adaptations. The present cross-sectional comparative study addressed the anthropometric characteristics of the three major tribal communities of Tripura, the Tripuri, Reang, and Jamatia, while countering the notable tendency to consider tribal groups as a homogeneous unit. **Methods:** The study involved 120 male participants in the age range of 17–21 years from each of the three communities and applied standardized anthropometric methods. The variables measured included height, body mass and BMI, body proportions, skinfold thickness, and components of the somatotype. **Results:** The three communities were comparable with regard to age ($p = 0.570$), height ($p = 0.332$), body mass ($p = 0.598$), and BMI ($p = 0.386$), with mean BMI values across groups being normal. Endomorphic mesomorphic body types along with anthropometric homogeneity suggest similar lifestyle related factors directly associated. Tripuri participants exhibited the most urban sedentary lifestyle, Reang participants preserved functional strength and leanness due to activities in the hills, and Jamatia participants displayed significant upper body strength and muscular endurance due to their warrior background. **Conclusion:** The study demonstrates the integration of statistical dimensions and natural, cultural, and socio-economic variables are crucial for a comprehensive understanding of the intra-tribal biological diversity of the subcontinent.

Keywords: Tribal community, Tripura, Somatotype, Morphology, Tripuri.

Resumen

Introducción: El perfil antropométrico de una población es crucial para comprender su diversidad biológica, estado nutricional y adaptaciones al estilo de vida. El presente estudio comparativo transversal analizó las características antropométricas de las tres principales comunidades tribales de Tripura: Tripuri, Reang y Jamatia, contrarrestando la tendencia a considerar a los grupos tribales como una unidad homogénea. **Métodos:** El estudio incluyó a 120 participantes masculinos de entre 17 y 21 años de cada una de las tres comunidades y aplicó métodos antropométricos estandarizados. Las variables medidas incluyeron estatura, masa corporal e IMC, proporciones corporales, grosor de los pliegues cutáneos y componentes del somatotipo. **Resultados:** Las tres comunidades fueron comparables en cuanto a edad ($p = 0,570$), estatura ($p = 0,332$), masa corporal ($p = 0,598$) e IMC ($p = 0,386$), con valores medios de IMC normales en todos los grupos. Los somatotipos endomórficos mesomórficos, junto con la homogeneidad antropométrica, sugieren factores similares relacionados con el estilo de vida. Los participantes Tripuri mostraron un estilo de vida sedentario más urbano, los participantes Reang conservaron fuerza funcional y delgadez debido a sus actividades en las colinas, y los participantes Jamatia exhibieron una fuerza significativa en la parte superior del cuerpo y resistencia muscular debido a su tradición guerrera. **Conclusión:** El estudio demuestra que la integración de dimensiones estadísticas y variables naturales, culturales y socioeconómicas es crucial para una comprensión integral de la diversidad biológica intratribal del subcontinente.

Palabras Clave: Comunidad tribal, Tripura, Somatotipo, Morfología, Tripuri.

Introduction

Anthropometry provides relevant information regarding the size, shape, and proportion of the human body (Saha *et al.,* 2025). In biological anthropology, anthropometry gives quantifiable information that can show the person's genetic origin, genetic adaptations, nutritional status, and socio-economic conditions. Anthropometric profiling of indigenous population along with documentation is critical for determining population diversification, possible health and nutrition related risk factors, and early stage public health planning. In India, the tribal populations include different biological constituents shaped from extreme ecological, cultural, and subsistence variations. The tribal groups are the most representative of such complexity. Systematic anthropometric studies are very important in such places for the understanding of human adaptability and diversity. North-East India is acknowledged as the region with the highest ethnic and biological diversity in India. Population diversity is due to the multiple migratory flows and extended community isolation in challenging geo-physical settings. Anthropological studies in this region have emphasized the extent of inter- and intra-population diversity regarding body size and shape, facial morphology, and nutritional status (Bandyopadhyay *et al.,* 2022; Choudhury *et al.,* 2013).

Tripura, a small hilly state within this region, has a special anthropometric research position due to the presence of multiple distinct tribal groups with different histories, ecologies, and cultures. The tribal population has several Scheduled Tribes, with the Tripuri, Reang and Jamatia as the major groups. These communities have a common linguistic affiliation with the Tibeto-Burman family and engage in traditional subsistence activities including shifting cultivation, settled agriculture, and activities related to the forest (Choudhury *et al.,* 2013). Despite these commonalities, each group has developed a unique socio-cultural identity with distinct patterns of marriage, settlement, and resource utilization. Such socio-cultural differences can influence growth patterns, body composition, and anthropometric characteristics as a whole, which makes comparative profiling equally justifiable and necessary. In Tripura, previous studies in anthropology have mostly concentrated on particular communities and specific age cohorts (S. Das & Chatterjee, 2025). Research on school going children and adolescents has documented undernutrition of varying degrees, particularly in rural and tribal settings, as evident in height-for-age, weight-for-age, and body mass index measures (Deb & Dhara, 2013; Uddin *et al.,* 2015). There is persisting influence of inadequate socio-economic conditions and poor diet on growth in these studies. Apart from the socio-economic conditions, the inadequate data on children and adolescents limit our understanding of the biological profile of the adult members of the tribal population. In recent times, adult anthropometric studies, particularly in relation to obesity, body composition, and health risk assessment, have attracted attention in Tripura (Paul *et al.,* 2020).

Research conducted on the Tripuri women and the impact of basic anthropometric variables such as body mass index, waist circumference, and skinfold thickness, on the health implications of obesity, is relevant (Das et al., 2023). Comparative research studies on adult north-eastern Indian tribals have sought to identify regional variance within the body fat composition and somatic structure of varying ethnic groups, thus necessitating the establishment of specific reference values for each population (Das & Chatterjee, 2025). The results indicate that tribal and rural demographic groups have cut-off values that standard reference criteria from urban/non-tribal populations will not adequately address. Additionally, anthropometric research speaks to the various associated functional correlations and the physiology. Research conducted by Maitra *et al.* (2023) found that various anthropometric variables, bone mass, and hemoglobin concentrations were associated within the Tripuri and Chakma populations (Maitra *et al.,* 2023). The evidence suggests that anthropometric analysis is often underestimated within a population and supports the idea that other various qualities associated with the population's anthropometric variables must be studied to address the overall health of the population. The common practice of grouping tribal populations into a single category overlooks important biological diversity shaped by differences in ecology, lifestyle, and socio-economic transitions (Banerjee, 2022; Choudhury, 2013). The consequences of this oversimplification include the stunting of the development of focused health and nutrition strategies and the impoverishment of the anthropological perspective concerning the diversity of populations in the state. In this context, the current study deals with the anthropometric profile of the three predominant tribal communities of Tripura. The study examines selected anthropometric variables for these communities and aims to enhance the understanding of intra- community diversity and of the inter-community biological affinity, as a result of the aforementioned common regional factors.

Materials and Methods

Study Design

This analysis employed a cross-sectional comparative study strategy to look into the anthropometric measurement of certain tribal communities of Tripura and make a comparison. This design was opted to assess the physical attributes of various groups without any modifications of the variables, and is also applicable to the study of characteristics of a group at one point in time (Table 1).

Participants

The study sample comprised of 120 male individuals, constituting 40 participants each from the three tribal communities of Tripura, namely, Tripuri, Reang, and Jamatia. A random sampling method was used to choose the participants from the students at ICFAI University Tripura, who were from different regions of the state.

Table 1. Anthropometric Variables, Equipment, And Measurement Procedures

Variables	Equipment	Measurement Procedure
Age	University records	Chronological age was recorded from official university documents and confirmed verbally with the participant.
Height	Stadiometer (Seca 213 Portable Stadiometer)	Measured with the participant standing erect, barefoot, in the Frankfurt plane, with heels together and body fully extended.
Body mass	Digital weighing scale (Omron HN-289 Digital Scale)	Measured using a calibrated digital scale with the participant barefoot and wearing light clothing.
Biceps skinfold	Skinfold caliper (Harpenden Skinfold Caliper)	Measured vertically at the midpoint of the anterior upper arm between the acromion and olecranon processes.
Triceps skinfold	Skinfold caliper (Harpenden Skinfold Caliper)	Measured vertically at the midpoint on the posterior upper arm between the acromion and olecranon processes.
Subscapular skinfold	Skinfold caliper (Harpenden Skinfold Caliper)	Measured diagonally just below the inferior angle of the scapula.
Supraspinale skinfold	Skinfold caliper (Harpenden Skinfold Caliper)	Measured diagonally above the anterior superior iliac spine along the natural line of the iliac crest.
Medial calf skinfold	Skinfold caliper (Harpenden Skinfold Caliper)	Measured vertically at the site of maximum calf girth on the medial aspect.
Humerus breadth	Sliding caliper (Holtain Bicondylar Caliper)	Measured between the medial and lateral epicondyles of the humerus with the elbow flexed.
Femur breadth	Sliding caliper (Holtain Bicondylar Caliper)	Measured between the medial and lateral condyles of the femur with the knee flexed.
Arm girth	Non-elastic measuring tape (Seca 201 Ergonomic Measuring Tape)	Measured at the midpoint of the upper arm between the acromion and olecranon processes with the arm relaxed.
Calf girth	Non-elastic measuring tape (Seca 201 Ergonomic Measuring Tape)	Measured at the point of maximum circumference of the calf in standing position.
Shoulder span	Spreading caliper (Holtain Anthropometer Set)	Measured as the linear distance between the right and left acromial processes.
Head circumference	Non-elastic measuring tape (Seca 201 Ergonomic Measuring Tape)	Measured at the maximum occipito-frontal circumference of the head.
Arm span	Anthropometric tape (Seca 201 Ergonomic Measuring Tape)	Measured as the distance between the tips of the middle fingers with arms fully extended horizontally.
Leg length	Anthropometric tape (Seca 201 Ergonomic Measuring Tape)	Measured from the anterior superior iliac spine to the medial malleolus.

Note: All measurements were taken in a well-lit room at ICFAI University Tripura during morning hours to minimize diurnal variation. Each variable was measured three times and the mean value was recorded. All measurements were performed by level II anthropometrist to ensure consistency and reduce observer bias.

The participants' ages were between 17 and 21 years old, a range, which represents late adolescence and early adulthood, a phase of development wherein growth and body proportions are relatively stable. The study sample was comprised solely of male participants to eliminate the variability of the anthropometric measurement parameters due to sex. Before participate in the study all the participants singed on consent form and the study protocol was approved by ethical committee of ICFAI University Tripura.

Inclusion and Exclusion Criteria

Only male, between the ages of 17-21, self-identified along with family background as member of one of the tribal groups of Tripuri, Jamatia, or Reang, and was free from any acute illnesses as of the date of data collection were selected for the study. Participants were excluded if they had a chronic history of disease, or musculoskeletal injury, had any physical deformities, were on any medical treatment that had potential to effect growth or body composition, or did not provide informed consent.

Statistical Analysis

The data was systematically categorized and according to distribution pattern summarize the anthropometric characteristics for all members of each group. A comparative analysis was also performed to investigate the differences between the Tripuri, Reang, and Jamatia groups. The level of statistical significance was set at $p \leq 0.05$.All the statistical analysis was perform using Jamovi (ver: 2.6.19) free statistical software.

Results

Table 2. Demographic Characteristics of Tripuri, Reang and Jamatia Communities

Community	Age (Years)	Height (cm)	Body Mass (kg)	BMI (Kg/m2)
Tripuri	19.2±1.43	167.4±3.56	59±4.91	21.1±2.13
Reang	18.8±1.5	168.7±4.12	59.1±4.15	20.8±1.64
Jamatia	19±1.34	167.7±3.45	60±4.75	21.4±1.84
P value	0.570	0.332	0.598	0.386

As shown in the Table 2, participants in the three groups were statistically similar in terms of age, height, weight, and body mass index. All participants had normal BMI values, this means that the participants' nutritional status were adequate, and same goes with their respective populations or communities. All statistical tests did not reveal significant difference for every anthropometric measures, therefore, this indicates the homogeneous tribal populations in anthropometric measurements for all the selected tribal groups of Tripura.

Table 3. Anthropometric profile of selected tribal communities of Tripura

Community	Shoulder Span (cm)	Head Circumference (cm)	Arm Span (cm)	Leg Length (cm)
Tripuri	42.6±1.61	56.1±1.08	171.2±3.76	92.8±3.1
Reang	42.9±1.44	56±1.22	171.9±3.84	92.8±3.2
Jamatia	42.5±1.66	55.8±1.02	170.9±3.32	93.2±2.82
P value	0.572	0.464	0.470	0.806

Table 3 shows, mean values of head circumference, shoulder span, arm span, and leg length show there are only minor differences among the three communities these result portray the lack of heterogeneity in anthropometric profiles of the selected tribal communities of Tripura, which suggest they possess comparable body proportions and body structure attributes.

With respect to the somatotype distribution, members of the Tripuri, Reang and Jamatia communities predominantly lie within the mesomorphic range, with a slight orientation towards the ectomorphic range (Table 4) . This indicates that all three groups predominantly exhibit a combination of moderate muscularity and a relatively tall and slender body. Furthermore, the minimal inter-community difference in body type is evidenced by the close proximity of the data points, as shown in figure 1.

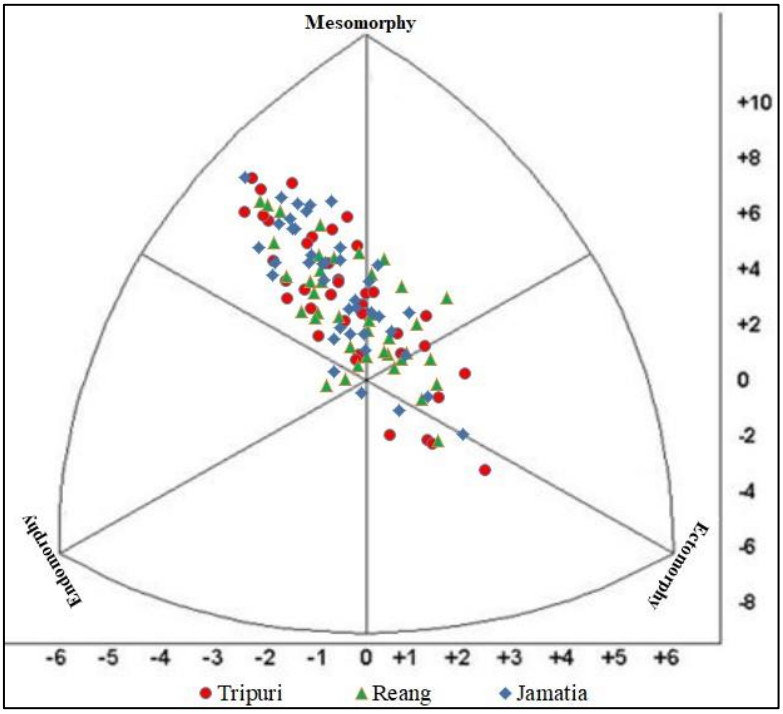

Figure 1. Somato plotting of various tribal community of Tripura

Table 4. Somatotype profiles of Tripuri, Reang and Jamatia communities.

Community	Endomorphy	Mesomorphy	Ectomorphy	Body fat (%)
Tripuri	3.45±0.242	4.65±0.847	3.01±1.182	16.08±0.713
Reang	3.47±0.253	4.58±0.729	3.19±0.966	16.13±0.739
Jamatia	3.51±0.213	4.86±0.761	2.86±1.013	16.29±0.749
P value	0.419	0.230	0.345	0.417

Table 4 represented the somatotype profile of the Tripuri, Reang, and Jamatia communities showed comparable somatotype characteristics and body fat levels. All three groups exhibited a balanced mesomorphic dominance, indicating moderate muscular development.

Discussions

The current analysis attempts to explain the somatotype components and body fat distribution characteristics of the Tripuri, Reang, and Jamatia tribal communities of Tripura, and their interrelationship with historical context, current modes of living, and ecological adaptation. While the quantitative data did not yield statistically significant differences among the three communities, the qualitative interpretation of the data reflects significant differences influenced by patterns of lifestyle change, mode of occupation, and cultural background.

The Tripuri community were the original inhabitants of Tripura. Some of the practices of the Tripuri people include jhum cultivation. This practice, along with other activities, takes significant amounts of physical exertion, and promotes the development of a strong, enduring body. However, there has been a large negative lifestyle shift among Tripuri people. Most people from the Tripuri community have moved to the plains, especially to cities and towns like Agartala. There, they engage far less in heavy physical work. Because of this shift from agrarian and forest based work, to business and service, there has been a drastic drop in habitual levels of physical work. This explains why many young Tripuris exhibit low stamina and muscular strength, with body fat accumulation, or with a thin body (Maitra *et al.,* 2023). Previous anthropometric studies of the Tripuri community found a high degree of mesomorphic body type, and a degree of endomorphy, among Tripuris. Most of the studies note the tendency of this community to succumb to the negative effects of lifestyle changes (Paul et al., 2020). This is a product of a community with a long history, solid genetic continuity and modern urban practices with improved early nutrition.

Members of the Reang community mostly inhabit the hilly and forested areas of Tripura. They continue to practice a lifestyle that revolves around physical activity, involving jhum cultivation and daily movement on rough and steep terrain, as well as load carrying and performing a variety of household tasks that predominantly engage the lower body. All of this activity shapes a lifestyle that fosters a distinctive body morphology characterized by lower body functional strength, and a shorter stature. The Reang community displayed a slightly greater linearity, and lower levels of body fat, but these values were not statistically different from the other communities. Their lifestyle remains active, and energy demanding, which is in great part responsible for these attributes (Uddin *et al.,* 2015). The Reang community members exemplify an adaptive balance between leanness and strength that is often overlooked for muscular bulk.

Among the various tribes of Tripura, the Jamatia people stand out in particular for their historical identity as warriors and their association with the Tripura kings as early as the beginning of their military service. Like the Tripuri and Reang, Jamatia practiced jhum cultivating in the hills, which developed areas of high physical strength, endurance, and resilience. Even today, Jamatia people are described as strong, fearless, and skilled manual laborers. The Jamatia are known for their increased mesomorphic component, which indicates that they have a rather compact and muscular body. This may be due to positive genetic attributes that are enhanced by Jamatia`s culturally established labor practices. The anthropological literature notes that communities with a heritage of military service and intensive positive labor practices tend to demonstrate high muscular development through the generations (Choudhury *et al.,* 2013; Maitra *et al.,* 2023). Although Jamatia, Tripuri, and Reang peoples have many qualitative differences, the large anthropometric overlap and lack of statistically significant differences of any of the three to Endomorphy, Mesomorphy, Ectomorphy, and body fat percentage delineates the three communities. The large anthropometric overlap can be attributed to a common Tibeto Burman ancestry, a homogenous and shared diet and an increased presence of mixed cultures.

The close genetic ties among Northeast Indian tribal groups are well-established. The research shows that at the group level, variation depends more on environmental and occupational settings than on genetic factors (Bandyopadhyay *et al.,* 2022; Devi *et al.,* 2014). The present research findings are impacted by the sociocultural context of the participants. While the communities have different historical ways of life, the current sample captures a generation of participants who are experiencing a rapid cultural amalgamation. The participants, especially the members of the Tripuri and Jamatia groups, have been socialized to urban ways, to environments with less manual work, and to more varied diets. This likely socialization is a factor, in addition to the aforementioned studies, in the fat percentage homogeneity, which were conducted with tribal populations in Northeast India (Das & Chatterjee, 2025).

The study unavoidably has limitations as the information gathered was solely from student participants from the ICFAI University Tripura, covering diverse academic departments, as opposed to general tribal populace. Significantly, most study participants were born and brought up in Agartala City, or the adjacent urban region, and many participants even belonged to the third generation of urban families. These individuals are most likely from business and service families as opposed to tribal families whose primary livelihoods are based on agriculture or forestry. Therefore, the perceived anthropometric attributes are likely attributed to a customary urban environment, low mobility and mixed culturally, and not from a typical tribal setting. This urban centric bias could have diminished the interstate variation, especially the rural or remote hilly area tribal populace.

Conclusion

The study concludes that Tripuri, Reang and Jamatia communities demonstrate a broadly similar anthropometric profile, and qualitative interpretation shows significant lifestyle-related differences. The Tripuri demonstrate a shift towards sedentary urban lifestyles, the Reang maintain a physically active hill-based disposition which fosters leanness and strength, and the Jamatia display attributes in accordance with their warrior ancestry and a physically active culture. These findings highlight the need to combine anthropometric data with cultural and lifestyle information for a more accurate interpretation, and identify the need for further research involving rural and community-based samples to fully document the tribal physical diversity within the state of Tripura.

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Conflicts of Interest

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Informed Consent Statement

All the athletes included in the study provided written informed consent.

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