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THE ROLE OF ANTHROPOMETRIC VARIABLES IN ASSESSMENT OF OBESITY AMONG TRIPURI WOMEN OF NORTH-EAST INDIA

Piyali Das[1], Kusum Ghosh[2], Arkopala Bose[2],
Diptendu Chatterjee[2], Arup Ratan Bandyopadhyay[2]

[1] *Department of Anthropology, Dinabandhu Mahavidyalaya, Bongaon, India*
[2] *Department of Anthropology, University of Calcutta, India*

ABSTRACT

Obesity is an etiologically complex and multifactorial phenotype, underpinned by genetic, environmental, socioeconomic and behavioural or psychological factors. Worldwide prevalence of obesity is reaching epidemic or pandemic proportions, which has resulted in an increased prevalence of obesity-related co-morbidities and financial burden that needs effective interventions. The prevalence of obesity varies significantly across the world, and several studies have been conducted in this regard in different regions on different age groups, but studies on the tribal female population of Northeast India are underrepresented, being mostly limited to schoolchildren. Under these circumstances, the present study was conducted to assess the prevalence of obesity among the tribal females of Tripura, Northeast India.

To achieve this purpose, the present study was conducted on 114 adult Tripuri females of Northeast India. Data were collected on anthropometric variables – height, weight, waist circumference (WC), and hip circumference (HC) – by using the standard technique. Then, from these anthropometric measurements, a number of indices – waist-stature ratio (WSR), body mass index (BMI), conicity index (CI) and waist-hip ratio (WHR) were calculated. The necessary descriptive and inferential statistics were calculated by using SPSS version 18.

The present study vindicated that only 22% women were overweight as per BMI, but 88% and 72% women were in the high-risk category on the basis of WHR and WSR respectively. Moreover, 86% of the females were biconic, which indicates higher prevalence of central obesity among the studied population.

Therefore, it can be concluded that anthropometric variables can be used as one of the efficient tools to assess obesity and health status of the Tripuri women.

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More in-depth studies using large samples and other different anthropometric indicators are required for better insightful approach towards ethnic group specific public health policy making.

Keywords: *obesity; anthropometry; women's health; scheduled tribe; Northeast India*

INTRODUCTION

Obesity is a chronic disease [13, 26] which results from a positive energy balance regulated by a complex interaction between endocrine tissues and the central nervous system [6, 19]. It has a multifactorial etiology that includes genetic, environmental, socioeconomic, and behavioural or psychological influences [37, 27, 17]. Excess adiposity may have a negative effect on health [12]. Depending on the degree and duration of weight gain, it can exacerbate a wide spectrum of co-morbidities [16, 12, 36, 20] which include metabolic syndromes (hypertension, type 2 diabetes mellitus, cardiovascular diseases, dyslipidemia, liver dysfunction, respiratory and musculoskeletal disorders), reproductive health issues (from subfertility to infertility), psychosocial problems (negative body image perception, low self-esteem, depression, and decreased quality of life), and even certain types of cancer. Besides these health consequences, higher prevalence of this condition is also a matter of concern. A phenomenal rise has been observed in the prevalence of overweight and obesity among Indian adults [18]. Recent data show that in India women (15–61%) have higher prevalence of overweight and obesity than men (12–54%) [25, 32]. According to the figures released by the World Health Organization, the prevalence of obesity will gradually increase to 57.8% worldwide by 2030 [38], i.e., reaching epidemic to pandemic proportions [23, 33]. Until a few decades ago, this pandemic of obesity was restricted only to developed, high-income countries, but recently, it has penetrated even the poorest nations like India. India has undergone considerable socioeconomic transition [29, 1] resulting in undernutrition due to poverty and obesity due to industrialization and rapid urbanization, which means experiencing a double burden of malnutrition [28], and Northeast India is not an exception. Although the prevalence of overweight and obesity is still low in North-east Indian states, its increasing trend (1.3–14.5%) is a definite cause for concern [4, 7]. The great prevalence of this condition and its severe consequences for health make the prevention of obesity a major public health priority. Therefore, prevention strategies are very important in this regard, as in turn, these will also lower the medical costs [7].

There are several socially disadvantaged communities in India. Tribal populations are more deprived among them. India has a variety of tribal communities that constitute about 8.6% of the total population, but little research has been done on them [31]. A few studies have been conducted among the tribal children to assess their health status [24], but such studies on tribal women are scanty in number [7]. In-depth examinations of overweight and obesity of these tribal communities are very essential, as they are often compromised by low literacy and poor access to healthcare services [9, 21]. Anthropometry is a non-invasive and inexpensive method, used by many scientists to determine the state of health [31]. Evidence suggests that distribution of body fat rather than total fat content is the major contributing factor for the evaluation of obesity. Body mass index (BMI) is thought to be a simple index that is commonly used to assess obesity. Different anthropometric variables, mainly BMI and WC, play a key role in this regard [3]. But nowadays, instead of using general obesity markers regionwise, body fat distribution pattern in terms of waist circumference (WC), hip circumference (HC), waist-hip ratio (WHR), and conicity index (CI) are taken into contemplation [10, 38].

The prevalence of obesity is varying significantly across the world and also shows ethnic differences. Therefore, it is important to design region-specific public health policies [38]. Several studies have been conducted in this regard in different regions on different age groups [31, 5, 21]. Tripura as the third smallest state of Northeast India is known for its cultural heritage, lifestyle and population. Tripura consists of both indigenous ethnic and mixed non-ethnic population. Tripuris are one of the tribal communities of the state, and they are an aboriginal group. Very few studies are available on the tribal groups of Tripura. Recent studies had been done among the Tripuris, but these mostly concern schoolchildren [31, 30].

So, against this backdrop, the present study is an attempt to estimate the obesity and fat distribution pattern on the basis of some essential anthropometric variables of Tripuri females living in Tripura, Northeast India.

MATERIAL AND METHODS

The present study was conducted among 114 adult Tripuri women (aged 18–70 years) from Tripura, Northeast India during 2021–2022. Prior to the study, verbal and/or written consent was obtained from the participants. Data were collected on anthropometric variables such as height, weight, WC, and HC by using standard techniques [35]. Then, by using these anthropometric

measures, a number of indices like WHR, WSR, BMI, and CI were calculated. The necessary descriptive and inferential statistics were calculated by using SPSS version 18.

RESULTS

Table 1 demonstrates the mean values of different anthropometric variables and their derivatives (BMI, WHR, WSR, CI). The mean age of the studied population is 34.07 ± 13.59 years and the mean height 152.46 ± 6.95 cm, weight 52.71 ± 11.02 kg, BMI 22.37 ± 3.83, WC 78.63 ± 10.75, HC 89.62 ± 9.46, WHR 0.88 ± 0.11 and WSR 0.52 ± 0.07. Moreover, the CI value of the studied population is 1.23 ± 0.12, which is nearer to perfect double cone value, indicating central obesity, but due to the lack of cut-off points, its uses are limited.

Table 2 shows the distribution of BMI among the Tripuri females. 57% of the studied females belong to the normal category, followed by overweight (22%), pre-obese (11%) and obese (4%). Only 6% were found to be in the underweight category.

Table 3 shows that, according to WC, 43% of the studied population is in the range of higher risk of developing obesity, while WHR and WSR vindicate a somewhat different result – based on WHR and WSR, 88% and 72% of the females are in the high-risk category. According to CI, 86% females are biconic (Table 4), whereas only 8% and 6% of females belong to the cylindrical and the biconcave category (Fig 1). This result indicates higher prevalence of central obesity among the studied population.

Table 1. Distribution of anthropometric variables among Tripuri females.

	Variables (Mean ± SD)								
Tripuri females	Age (years)	Height (cm)	Weight (kg)	BMI	WC (cm)	HC (cm)	WHR	WSR	CI
	34.07± 13.59	152.46± 6.95	52.71± 11.02	22.37± 3.83	78.63± 10.75	89.62± 9.46	0.88± 0.11	0.52± 0.07	1.23± 0.12

Table 2. Distribution of BMI among Tripuri females.

Underweight (<18.5) N (%)	Normal (18.5–22.99) N (%)	Overweight (23.00–24.99) N (%)	Pre-obese (25.00–29.99) N (%)	Obese (≥ 30.00) N (%)		
				Class I	Class II	Class III
7 (6%)	65 (57%)	25 (22%)	12 (11%)	4 (03%)		1 (1%)

Table 3. Distribution of anthropometric indicators among Tripuri females.

Waist circumference	Low risk (< 80 cm)	High risk (≥ 80 cm)
	65 (57%)	49 (43%)
Waist-hip ratio	**Low risk (< 0.81)**	**High risk (≥ 0.81)**
	14 (12%)	100 (88%)
Waist-stature ratio	**Low risk (< 0.5)**	**High risk (≥ 0.5)**
	32 (28%)	82 (72%)

Table 4. Distribution of conicity index (CI) among Tripuri females.

Variables	Biconcave CI < 1.0	Cylindrical CI = 1.0	Biconic CI > 1.0
Conicity index (CI)	7 (6%)	9 (8%)	98 (86%)

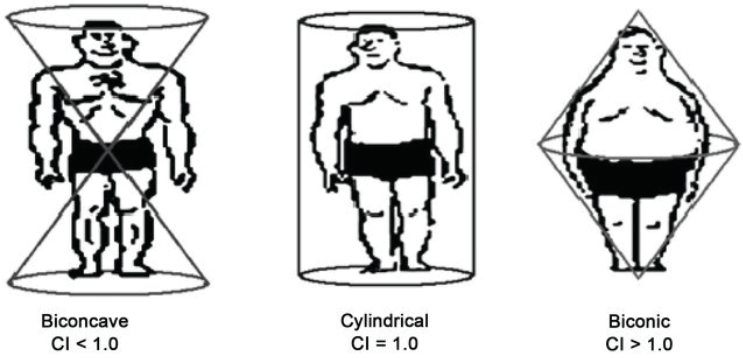

Figure 1. Images of biconcave, cylindrical and biconic body types as per conicity index.

DISCUSSION

Obesity is a condition characterized by an increase in the size and amount of fat cells in the body. According to WHO, at least 2.8 million people worldwide die each year because of being overweight or obese, and an estimated 35.8 million (2.3%) of global DALYs are caused by overweight or obesity [18]. Moreover, overweight and obesity are associated with a number of health consequences. Despite several health consequences and high prevalence, obesity is rarely addressed in the context of research. Therefore, this scenario has become a serious public health concern in rural and urban India irrespective of ethnic groups [11, 15].

The present study demonstrated high prevalence of general and central obesity among the Tripuri women, which is in corroboration with the earlier studies done among different ethnic groups of Tripura, Northeast India [14, 2, 8] and with studies from other parts of Northeast India [15].

Moreover, different studies conducted among the diverse tribal populations of Tripura have demonstrated that central obesity has a direct relationship with hypertension and type 2 diabetes mellitus [14, 2]. Furthermore, other studies among different ethnic women of Tripura have also revealed an association between central obesity and cardiometabolic risk factors [32]. Thus, urgent attention is needed to prevent obesity-related health outcomes as intertribal variations subsist regarding the relations between different anthropometric variables and diseases [2, 34]. Therefore, more detailed studies among the women of distinct tribal populations using different discernible anthropometric variables are the imperative requisite for better understanding of the overall women health scenario of the Northeast region. The present attempt tries to provide information to the decision makers regarding the health status of the studied population, which may facilitate them in policy making to ensure health coverage of the tribal women and prioritize equitable access of health care services to them.

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Address for correspondence:
Piyali Das
Department of Anthropology, Dinabandhu Mahavidyalaya, Bongaon
Bongaon Dist. North 24 Parganas, West Bengal, India, Pin: 743235
E-mail: piyalidas24@gmail.com