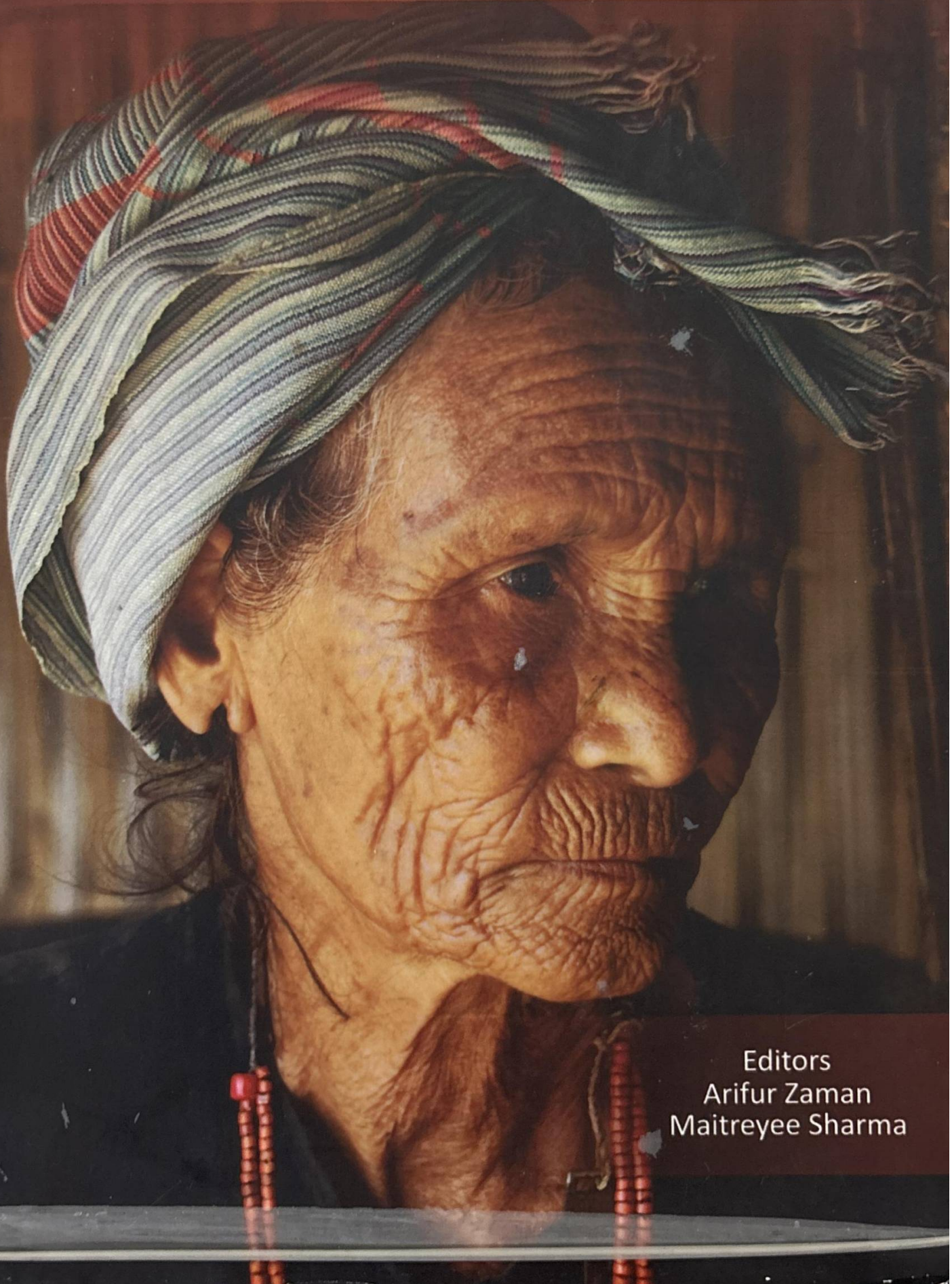


Anthropological Aurora of North East India



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RELATIONSHIP BETWEEN BODY MASS INDEX, BLOOD PRESSURE, AND AGE AMONG THE KAIBARTA FEMALES OF ASSAM

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Introduction

The complex problem of high blood pressure is increasingly becoming a serious health issue. Human blood pressure (BP) level depends on a multitude of factors and among them Body Mass Index (BMI) and age are two important predictors. There is a significant relationship between BMI and BP which has long been well documented among various populations more than seventy years ago (Larimore, 1923). Body Mass Index has been recognized as a factor which is positively related to increased morbidity and mortality from hypertension, cardiovascular disease, type II diabetes mellitus and other chronic diseases (Pi-Sunyer, 1993). Worldwide, about 58.0 percent of diabetes mellitus and 21.0 percent of ischemic heart disease are attributable to BMI above $21\text{kg}/\text{m}^2$ (World Health Organization, 2002).

Hypertension is considered as a major health problem among the aged population. Significant correlation between BP and age has been carried out by Sambasiva Rao (1983a, 1983b); Gopi Chand and Rao (2007) and many others. It has been estimated that in developing countries, high blood pressure is one of the risk factors for cardiovascular diseases and reported 7.1 million deaths especially among middle, and old-age adults are due to high BP. Globally 7.1 million people die due to high blood pressure, out of 13.0 percent of total population. About 62.0 percent of cardiovascular disease and 49.0 percent of ischemic heart disease are attributable to suboptimal BP (systolic $> 115\text{mmHg}$; WHO, 2002).

The present chapter aims to understand the blood pressure profile of the Kaibarta women of Assam in association with Body Mass Index and

age. Here an attempt has also been made to find out the prevalence of overweight/obesity and hypertension among the population under study.

Material and Methods

Studies on epidemiological profiles of blood pressure among the different socio-cultural populations inhabiting in rural areas of North-east India are conspicuous by their absence. Around the world, a traditional population often have low blood pressure ($< 120 / 80$ mmHg) and show a little increase with age (Dressler 1999). Kaibartas are one of the socio-economically backward scheduled caste populations of Assam. A major portion of Kaibarta population used to reside in rural areas with a low level of socio-economic condition. The present investigation has been carried out among the Kaibarta female population of Sutimukh *gaon* of Lakhimpur district of Assam.

Data for the present study were collected from 211 Kaibarta female age ranging from 20-69 years. The subjects were divided into five different age groups categories with ten years of interval each to study the age trend of height, weight, BMI, and BP. To collect the data, a door-to-door survey was carried out among the population under study.

Height and weight measurements were taken for the assessment of Body Mass Index by using standard protocols given by Weiner and Laurie (1981). Height was measured with an anthropometric rod without shoes to nearest 0.1cm and weight was recorded by using a portable weighing machine with minimum clothes.

Blood pressure was measured by an auscultatory method in the morning with a standard mercury sphygmomanometer, stethoscope, and appropriate inflatable cuff. The subject was asked to sit and take rest for at least five minutes by sitting in a chair with her right arm supported comfortably and the pressure cuff was applied closely to the upper arm. For the accurate blood pressure measurement was repeated twice with five to ten-minute interval.

Blood pressure has been classified into four categories i.e., normal BP, pre-hypertension, hypertension stage-I and hypertension stage -II based on the seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. According to this committee, normal BP is defined as less than 120/80mmHg; pre-hypertension as 120-139/80-89mmHg; stage I hypertension as 140-159/90-99mmHg; and stage II hypertension as equal to and above 160/100mmHg (JNC VII, 2003).

Body Mass Index (BMI) with its universal usage has emerged as an important indicator of health and nutritional status of the population. It was calculated as the body weight in kilograms divided by the height in meters squared (kg / m^2). The subjects can be broadly categorized into

underweight or chronic energy deficiency, normal weight, overweight and obese depending on BMI (WHO, 1998). A BMI of below 18.50 is regarded as underweight whereas 18.50-24.99 is regarded as normal weight. BMI 25-29 is considered as overweight and BMI over 30 kg/m² is defined as obese.

Mean and standard deviations were calculated and the significance of differences was determined with the help of t-test.

Result and Discussion

Blood pressure increased with increasing age. Increasing trend in systolic and diastolic blood pressure with advancing age was reported by various scholars such as (Kapoor *et al.*, 2012; Bordoloi and Kapoor, 2013; and Mungreiphy *et al.*, 2011) etc. The present study reported that age is significantly correlated with both SBP and DBP. Table 1 reveals that both SBP and DBP were found to be lowest among the young age group and relatively higher among the elderly subjects. Mean SBP and DBP was found to be higher in the age group of 50-59 years and lowest was found in the age group of 20-29 years.

Table 2 shows the basic data on stature and body weight and BMI of the Kaibarta female under study. The highest mean value for height was found in the young age group category of 20-29 years. Mean height decreased in each decade in the successive age groups and lowest mean height was found in between 60-69 years of age.

In the case of body weight, the highest mean value was found in the age group of 40-49 years whereas lowest mean body weight has been reported in between the age group of 60-69 years of age. A difference in mean body weight has been found statistically significant only between 50-59 years and 60-69 years of age.

BMI in various age groups has also been apparent from the Table 2. Maximum value for mean BMI was 19.66 kg/m² which was found in the age group of 40-49 whereas the minimum mean value for BMI (17.40 kg/m²) was found in the age group of 60-69 years. No statistically significant differences were found in any age group regarding the BMI.

Table 3 shows the test of significant of different variables with regards to different age categories. In the case of SBP, statistically, a significant difference has been recorded in most of the combinations between young and aged. Marked statistical difference with respect to DBP was also found when the comparison was made in-between the categories representing young and aged, and clearly reflects an association between age and blood pressure.

Age not only plays a significant role in the case of systolic and diastolic blood pressure, it also plays a vital role in the case of height and weight. With regard to mean height, statistically, a significant difference has been

found in between the age categories of two extremities. Body weight of an individual varies with changing age. Significantly low mean body weight has been observed in the case of persons who have crossed 60 years of age. Body Mass Index in middle-aged categories (40 – 59 years) record highest mean and thus stand significantly apart from the aged categories (60+ years) when BMI radically falls.

Table 4 displays the distribution of blood pressure in different BMI categories. Among the underweight BMI categories, 87.77 percent subject have the normal blood pressure, 10.0 percent belongs pre-hypertension blood pressure categories and only 2.22 percent have stage II hypertension blood pressure. Again in normal BMI category, 81.25 percent subjects have normal blood pressure, whereas 16.07 percent records pre-hypertension blood pressure. The frequency of stage I and stage II hypertension in normal BMI category is 1.78 percent and 0.89 percent respectively. Among the Kaibarta females, 55.55 percent of individuals having normal BP and 44.44 percent of pre-hypertension BP belongs to the overweight BMI category.

It is also clear from the Table 4 that maximum numbers of subjects were found in normal BMI category followed by those in the underweight category. Lowest numbers of subjects were found in the overweight category on the other hand overall obesity based on BMI among the Kaibartas female is conspicuously absent.

Distribution of blood pressure among the Kaibarta female in different age categories is shown in Table 5. A maximum number of normal blood pressures found in the age group of 30-39 years followed by age group of 20-29 years and lowest number was found in 60-69 years of age. The highest number of pre-hypertension BP has been reported from the age group of 40-49 years and 50-59 years, the percentage being 35.48 percent respectively. Only two Kaibartas female are found to have stage I hypertension BP and both of them belong to the age group of 30-39 years whereas, in other age categories, it is conspicuous by their absence. The table reveals that the frequency of stage II hypertension is 66.66 percent and 33.33 percent recorded in the age group of 50-59 years and 20-29 years respectively.

Table 6 displays the value of systolic and diastolic BP in different BMI categories. Analysis of the data demonstrated that minimum mean systolic and diastolic BP was found in the underweight category and the maximum systolic and diastolic BP were found in overweight category. Thus it is apparent that exhlarated BMI have higher SBP and DBP. The mean values of both the systolic and diastolic BP increased from underweight to normal and then to overweight category. Statistically, significant difference regarding the mean value of systolic blood pressure was found between underweight x normal and underweight and overweight BMI categories. But in the case of mean diastolic blood pressure, statistically, a significant difference has only recorded in between underweight and normal BMI

category. Thus, it is clear from the table that there is a significant relationship between blood pressure and BMI as both mean systolic and diastolic BP increased with increasing BMI level. The present study corroborates with the findings drawn by Mungreiphy *et al.*, (2011).

Conclusion

The present study reveals a close relationship between BP, BMI, and age among the Kaibarta women inhabiting in the rural areas of Lakhimpur district of Assam. Both SBP and DBP were found to be related to age. Mean systolic and diastolic blood pressure was found to be higher among the aged subject as blood pressure increases with increasing age. Maximum mean blood pressure in both SBP and DBP has been reported from overweight category whereas lowest blood pressure was found in the underweight category. It has been noted that among the Kaibarta women under study the frequency of underweight is quite high where overall obesity based on BMI is conspicuously absent.

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Table 1: Age-wise distributions of Blood Pressure among Kaibarta females

Categories	Age groups (in years)	Blood Pressure						
		N	Systolic Blood Pressure			Diastolic Blood Pressure		
			Mean	SD	SE	Mean	SD	SE
I	20-29	64	103.59	14.11	1.76	55.85	11.97	1.49
II	30-39	72	106.20	11.38	1.34	61.35	12.58	1.48
III	40-49	39	110.97	14.126	2.26	65.25	12.39	1.98
IV	50-59	30	118.36	18.60	3.39	72.7	15.63	2.85
V	60-69	6	107.66	15.13	6.17	60.83	10.68	4.36

Table 2: Age-wise distribution of Stature, Weight, and BMI among Kaibarta females.

Categories	Age groups (in years)	Height(cm)			Body weight			Body Mass Index		
		Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
I	20-29	152.8	4.58	0.57	44.89	6.29	0.79	19.23	2.19	0.27
II	30-39	152.5	3.90	0.46	44.93	7.39	0.87	19.32	2.76	0.33
III	40-49	152.6	5.96	0.95	45.85	9.20	1.47	19.66	3.26	0.52
IV	50-59	151.5	5.96	1.09	44.60	8.24	1.50	19.44	3.08	0.56
V	60-69	149.6	3.05	1.25	38.83	5.67	2.31	17.40	2.42	0.99

Table 3: Test of significance

Comparison between age categories	Systolic Blood pressure	Diastolic Blood Pressure	Height	Body Weight	BMI
I x II	1.17	2.62*	0.4	0.03	0.21
I x III	2.6*	3.8*	0.18	0.57	0.73
I x IV	3.9*	5.24*	1.06	0.17	0.32
I x V	0.63	1.08	2.33*	2.48*	1.78

Table 4: Distribution of Blood Pressure in different BMI categories

II x III	1.81*	1.58	0.09	0.54	0.55
II x IV	3.34*	3.58*	0.84	0.19	0.18
II x V	0.23	0.11	2.18*	2.47*	1.84
III x IV	1.81*	2.15*	0.76	0.59	0.29
III x V	0.5	0.92	1.91	2.56*	2.02*
IV x V	1.52	2.28*	1.15	2.09*	2.14*

Table 5: Distribution of Blood Pressure in different age groups

Age Groups (in years)	Normal Blood Pressure		Pre-hypertension		Hypertension Stage-1		Hypertension Stage-2	
	No	%	No	%	No	%	No	%
20-29	61	34.86	2	6.45	--	--	1	33.33
30-39	64	36.57	6	19.35	2	100.0	--	--
40-49	28	16.00	11	35.48	--	--	--	--
50-59	17	9.71	11	35.48	--	--	2	66.66
60-69	5	2.86	1	3.22	--	--	--	--

Table 6: Distribution of SBP and DBP in different BMI categories

Classification of BMI	Blood Pressure (mmHg)									
	Systolic Blood Pressure					Diastolic Blood Pressure				
	N	Mean	SD	SE	t-value	N	Mean	SD	SE	t-value
Underweight < 18.50	90	104.61	15.55	1.64	2.8*	90	58.97	14.19	1.50	2.7*
Normal-weight 18.50-24.99	112	110.36	13.74	1.20	2.9*	112	64.08	12.72	1.20	0.93
Overweight 25.00-29.99	9	114.33	8.60	2.87	1.3	9	64.89	18.54	6.18	0.13