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Blood Pressure and Its Biocultural Correlates Among the Lepchas of Sikkim, India: A Microlevel Epidemiological Study

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A B S T R A C T

The present study evaluates the blood pressure profile among the Buddhist Lepchas, a tribal population, indigenous to the Sikkim Himalaya, in relation to selected biological, behavioral and sociocultural factors. The study subjects (aged 16 years and older) have been chosen from urban (Gangtok town, the capital of the State of Sikkim) and rural (Dzongu villages, about 75 km north of Gangtok) areas. The subjects inhabiting the urban area are engaged primarily in service sector, while those inhabiting the rural area are practicing agri-horticulture. The results reveal that significant age effect exists on logarithmically transformed blood pressures; sex effect is not significant. Among the anthropometric variables considered, calf girth and height are found to be significantly correlated with systolic and diastolic blood pressures, respectively. While disease status significantly affects systolic pressure, a significant effect of alcohol intake is discernible only on diastolic pressure. Furthermore, significant effects of rural/urban residence and educational level are found on blood pressures, both systolic and diastolic. Mean systolic and diastolic blood pressures of the urban Lepchas are found to be significantly higher compared to their rural counterparts. An increase in both mean systolic and diastolic pressures is noticed with increasing level of education, although the trend is not absolutely uniform.

Introduction

Over the last several decades, numerous studies have reported the influence of a variety of biological, behavioral, psychosocial and sociocultural factors on the blood pressure levels of many human population groups inhabiting diverse eco-logical settings[1–23]. Examining blood pressure profiles of populations and identifying

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its genetic and environmental correlates serve the important purpose of gaining insights into the etiologic factors for determining essential hypertension, which is a major public health problem for the developed countries. For many developing countries including India, the problem of essential hypertension has also been posing considerable concern in the field of public health owing to the emergence of epidemiological transition. Studies reveal that factors contributing to determination of blood pressure level vary in traditional and modernized or westernized populations[16,24].

Furthermore, even among traditional populations, major factors affecting blood pressure level may not be similar[25]. There is evidence that traditional societies can sometimes have high mean blood pressure or a high proportion of hypertensives[26,27], especially when such traditional groups migrate to relatively modern areas or undergo modernization *in situ*[28]. It has also been demonstrated that factors contributing to an increase in blood pressure may be population-specific[25,27].

Epidemiological studies of blood pressure among the Indian populations inhabiting contrasting ecological zones with varied sociocultural characteristics are rare. However, some studies have been conducted among socioculturally distinguishable rural and urban populations of West Bengal[29–31]. Recently, the epidemiological profile of blood pressure among the rural Lepchas of Sikkim Himalaya has been studied[32].

The present investigation among the Lepchas of the Sikkim Himalaya, inhabiting both urban and rural settlements, evaluates blood pressure profiles in relation to selected biological (age, sex, body dimensions, disease status), behavioral (tobacco use, alcohol intake, salt intake, oral contraceptive use) and sociocultural (area of residence, education) factors.

Materials and Methods

The Lepchas, indigenous to the Sikkim Himalaya[33] are a tribal population with Mongoloid morphological features. They, however, call themselves 'Rongkup' which means »sons of snowy peak«[34]. The Lepchas have a language of their own which is known as 'Rongring' included in the Tibeto-Burman family of languages[35]. The Lepchas were predominantly hunter-gatherers and shifting hill cultivators in the past; at present a sizeable majority of them are settled agriculturists. Some researchers suggested that settled agriculture began to be practiced by the Lepchas of Sikkim-Darjeeling probably during mid-nineteenth century[36]. Furthermore, with changing times and the spread of education especially since Sikkim's merger with Indian Union in 1975, Lepchas are increasingly found to be engaged also in non-agricultural occupations. In Sikkim, the Lepchas predominantly profess the Tibetan form of Lamaist Buddhism, while few have adopted Christianity. Monogamy is the marital norm for the Lepchas in general, though polygamous marriages are not rare. They however, do not practice polyandry; consanguineous marriages are not socially acceptable and therefore, not found to occur among them.

The Lepchas are distributed throughout the mountainous state of Sikkim. They are found to reside in both the urban and rural areas of the State, though concentrated heavily in the latter. For the present investigation, Lepchas inhabiting the Dzongu area, located in the North District, were chosen to constitute the rural study group, while Lepchas inhabiting the capital town of Gangtok and its neighborhood was chosen to constitute the urban study group.

The Dzongu area, one of the major concentrations of the Lepchas, located about 75 km north of Gangtok having 13 revenue blocks (clusters of villages) is a

Lepcha reserve where no communities other than the Lepchas are allowed to settle permanently. There are seven Panchayat Units in the Dzongu area which provide help to its residents chiefly in the domains of agriculture, fisheries, roads and communication, and so on. There are 37 schools of Primary, Middle and Secondary levels. There is 1 Primary Health Center (PHC) and 10 Primary Health Subcenters (PHSC). The Lepchas of Dzongu are mostly agri-horticulturists who grow paddy, maize, millet, buckwheat, wheat, pulses and vegetables on their own land for their own consumption. The Lepchas of Dzongu cultivate cardamom as the primary cash crop; cardamom was introduced at the beginning of the 20th century. The diet of the Dzongu Lepchas includes cereals (e.g. rice, maize and millet), roots and tubers, green leafy and other vegetables, meat (e.g. beef, pork and chicken) and occasionally fish. Alcoholic beverages are consumed practically by a vast majority of the Lepchas especially when they attain adulthood. They generally, but not exclusively, consume indigenous millet beer (*chi*). Consumption of alcoholic beverages among the Lepchas of Dzongu, is a traditional practice and especially preparation (or procurement) of *chi* in the household, irrespective of economic status, is a culturally preferred norm. *Chi* is consumed in large quantities during all social and religious ceremonies. Among the Lepchas of Dzongu, salt is consumed in fairly high quantity. Salt is consumed almost regularly with tea, besides being used freely and in cooked food. As a cooking medium, animal fat is often used.

The town of Gangtok in the East district is the largest urban center in Sikkim. Since 1975, when it emerged as the capital of an Indian State, the magnitude of development inputs, in term of infrastructure, trade and commerce, housing, health and education, tourism and so on in Gangtok has enormously increased. For economic, administrative and other reasons, Gangtok has witnessed an enormous growth of population, largely due to migration from different areas of the State as well as from areas outside the State. It has become a place, which accommodated diverse ethnic communities, permanent, and temporary settlers in a cosmopolitan mould. A sizeable proportion of Lepchas who reside in Gangtok town are migrants either from rural areas of different districts of Sikkim or from hill subdivisions of Darjeeling district of West Bengal. A large number of them are employed in Government and other establishments, while a relatively lesser number of them are engaged in business. Lepchas, inhabiting Gangtok in substantial numbers have adopted the urban way of life with better education, considerable change in their traditional dietary practices, increasing exposure to mass media and so on. Consumption of a variety of alcoholic beverages including traditional millet beer (*chi*) is also very common among them. Consumption of salt with tea, in addition to its use in cooked food items freely, remains a regular feature.

Buddhist Lepchas of both genders (aged 16 years and older) inhabiting three contiguous revenue blocks (namely, Barfok, Lingdong and Lingthem) of Dzongu area (at an altitudinal range of 3,000 ft. to 6,000 ft.) and those inhabiting Gangtok town and its neighborhood (at an altitudinal range of 4,000 ft. to 6,500 ft.) continuously for 10 or more years were selected for this study. Overall, 208 adults from the rural (Dzongu villages) area, engaged primarily in agri-horticulture, and 138 adults from urban (Gangtok town and its neighborhood) area, engaged primarily in service sector, were considered for the present study. Age groups and gender break up of the study subjects, by area and residence is shown in Table 1. Age was estimated with the

TABLE 1
SAMPLE SIZES BY AGE, GENDER AND AREA OF RESIDENCE

Age group (years)	Rural			Urban		
	Male	Female	Total	Male	Female	Total
29	36	31	67	26	27	53
30–39	41	35	76	24	20	44
40–49	13	13	26	13	11	24
50–59	10	8	18	6	5	11
60	16	5	21	3	3	6
Total	116	92	208	72	66	138

help of a traditional Lepcha calendar which follows a twelve year cycle with one-year periods, used especially when an accurate age record did not exist.

The same investigator took two consecutive blood pressure (systolic and diastolic) readings on the left arm of each subject in the sitting position after a 10-minutes rest. A single mercury sphygmomanometer was used for taking blood pressure measurements from all the subjects. All blood pressure and anthropometric measurements were taken at a time, between 08:00 hours and 14:00 hours. Data on body dimensions included the following anthropometric measurements: stature, weight, upper arm girth, calf-girth, triceps and subscapular skinfold thicknesses. Following standard techniques[37], one male investigator took anthropometric measurements of males and one female investigator took those of females. From each subject, the information on age, gender, level of education, self-reported disease status, current use of antihypertensive drugs, use of oral contraceptives (from married non-menopausal females) smoking, tobacco chewing, alcohol intake were collected. Salt consumption pattern among the subjects was noted in terms of their free use of salt, as well as its use in cooked food items and with tea. A semi-quantitative assessment of degree of salt intake was done by noting the number of cups of tea consumed per day added with salt. The frequency distribution of subjects by gender and area of residence with respect to categorical variables is shown in Table 2. Since two readings of blood pressures were available on each subject, the averages of the two systolic blood pressures (SBP) and two diastolic readings (DBP) were used for analyzing blood pressure data. The blood pressure values showed significant skewness and kurtosis; however, substantial reduction of skewness and kurtosis values was achieved by log-trans formation of SBP and DBP values. Therefore, logarithmically transformed values of both SBP and DBP have been used for the subsequent analyses.

In order to determine the effect of categorical secondary variables (i.e., area of residence, education, oral contraceptive use, disease status and gender) on the primary variables (i.e., SBP and DBP), effects of those secondary quantitative variables showing significant effects on one or both the primary variables were first removed.

For assessing the significance of the quantitative secondary variables considered, the set of quantitative variables was treated as a set of predictor variables for predicting either SBP or DBP. Multiple Regression Analysis was utilized which identified the subset of significant variables, from among the set of predictor

TABLE 2
FREQUENCY DISTRIBUTION OF CATEGORICAL VARIABLES, BY GENDER AND AREA OF RESIDENCE

Variable	Rural						Urban					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Education[a]												
Illiterate	36	31.03	62	67.39	98	47.12	0	0.00	5	7.58	5	3.62
Primary	49	42.24	18	19.56	67	32.21	7	9.72	8	12.12	15	10.87
Middle	23	19.83	8	8.70	31	14.90	16	22.22	11	16.67	27	19.57
Secondary	5	4.31	4	4.35	9	4.33	24	33.33	29	43.94	53	38.40
Higher	3	2.59	0	0.00	3	1.44	25	34.72	13	19.69	38	27.54
Oral contraceptive use												
Yes	–	–	17	18.48	17	18.48	–	–	2	3.03	2	3.03
No	–	–	75	81.52	75	81.52	–	–	64	96.97	64	96.97
Disease status[b]												
Hypertension/ chest pain	8	6.90	7	7.61	15	7.21	3	4.17	3	4.55	6	4.35
Well	108	93.10	85	92.39	193	92.79	69	95.83	63	95.45	132	95.65

[a] Illiterate: Unable to read and write; Primary: 1–5 years of schooling; Middle: 6–8 years of schooling; Secondary: 9–12 years of schooling; Higher: College/University education;

[b] Hypertension/chest pain: Reportedly suffering from hypertension and/or have experienced chest pain within 15 days of the survey; Well: Not reported to have suffered or suffering from vascular, circulatory, renal disorders, or diabetes.

variables. To examine the effects of categorically secondary variables, analysis of covariance was performed.

Subjects were identified as hypertensive (SBP values 160 mmHg and/or DBP values 95 mmHg) and borderline cases (SBP values between 141 and 159 mmHg and/or DBP values between 91 and 94 mmHg) following WHO[38] criteria.

Results

Table 3 shows the descriptive statistics (i.e. means, standard deviations and range of values) pertaining to age, SBP and DBP, pulse rate, anthropometric variables including indices viz., body mass index (BMI) and index of relative subcutaneous fat distribution, smoking, tobacco chewing, alcohol intake and salted tea intake, by gender and area of residence. It is evident from the table that with respect to both SBP and DBP, males had higher values compared to females, irrespective of area of residence and the trend is reversed in case of pulse rate. However, the gender differences are found to be non-significant at the 5% level. Urban males have higher mean values of both SBP and DBP compared to rural males, while among females this trend is observed for DBP only. Irrespective of gender, the urban group shows lower mean values of pulse rate, compared to the rural group. With respect to anthropometric variables, males have higher mean values compared to females except for triceps and subscapular skinfolds and BMI, irrespective of area of residence. Among males, no consistent pattern of difference exists between rural

and urban groups in anthropometric variables, whereas among females, the urban group shows high mean values compared to the rural group practically for all the anthropometric variables considered. Furthermore, with respect to numbers per day of cigarettes smoked, tobacco chewed, alcoholic drinks consumed and cups of salted tea consumed, no marked difference is found between genders in the rural group, although in urban group females generally show lower mean values compared to males. Irrespective of gender, urban group shows lower mean values for smoking and alcohol intake, while this trend is reversed for tobacco chewing; no marked difference is observed for salted tea intake.

The results of the multiple regression analysis using age, anthropometric and behavioral variables as predictors of log-transformed SBP and DBP, are presented in Table 4. Since no significant gender effect was noted, regression analysis is not done separately for the genders. Table 4 shows that both SBP and DBP differ significantly with age. A non-linear (quadratic) age trend is noticed for DBP. Scatter diagrams of SBP and DBP, separately for urban and rural groups are presented in Figure 1a and b, respectively. Calf girth and stature are the anthropometric variables significantly affecting SBP and DBP, respectively. Alcohol intake is the only behavioral variable that affects DBP significantly.

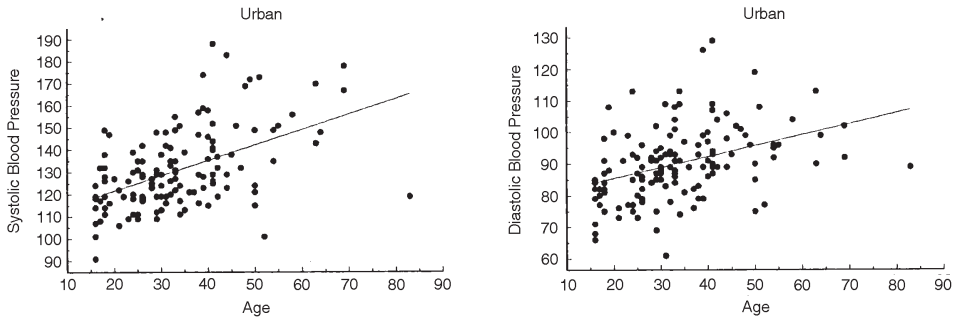

Fig. 1a. Systolic and diastolic blood pressures, lines of best fit among the Lepchas: Urban

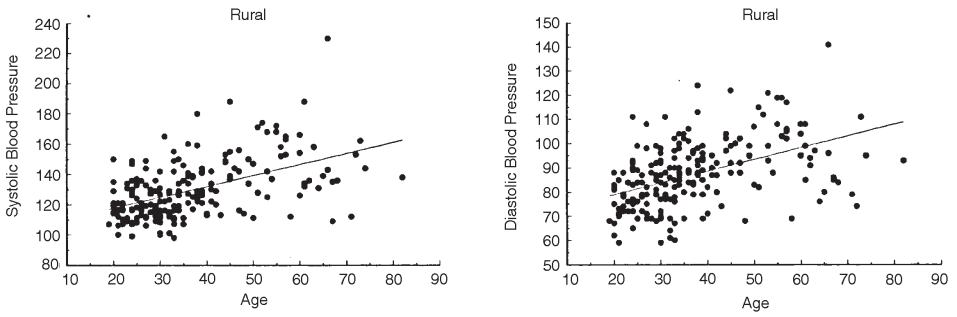

Fig. 1b. Systolic and diastolic blood pressures, lines of best fit among the Lepchas: Rural

Effects of qualitative categorical variables (i.e., gender, education, oral contraceptive use, disease status and area of residence) on SBP and DBP were examined by performing an analysis of covariance. Respective significant quantitative predictor variables for SBP and DBP (see Table 4) were used as covariates in each case. The analysis revealed that area of residence significantly influences both SBP and DBP (SBP: F ratio = 4.11; d.f. = 1,342, p = 0.0434; DBP: F ratio = 17.37; d.f. = 1,340, p < .00001) and so does education (SBP: F ratio = 2.63; d.f. = 4,339, p = 0.0348; DBP: F ratio = 3.22; d.f. = 4,337, p = 0.0130) Disease status affects only SBP significantly (SBP: F ratio = 7.57; d.f. = 1,342, p = 0.0062).

Adjusted mean SBP and DBP values are markedly higher in the urban group compared to the rural group. Although there is a trend showing increase in adjusted mean SBP and DBP values, more clear in the latter, with increasing level of education, the absolute uniformity in the trend is lacking (Table 5). Furthermore, as expected, adjusted mean SBP value is higher (138.85) among those who suffer reportedly from hypertension and/or chest pain than those who do not suffer from any cardiovascular, circulatory, renal disorders or diabetes (128.67).

The frequency distribution of hypertensive subjects, borderline cases and normotensive subjects by gender and area of residence is presented in Table 6. Table shows that the percentage of hypertensive subjects in the study population, irrespective of gender and area of residence is high. In both the urban and rural

TABLE 4
RESULTS OF MULTIPLE REGRESSION ANALYSIS USING AGE, ANTHROPOMETRIC AND BEHAVIORAL VARIABLES AS PREDICTORS

Dependent variable	Sample size	Significant quantitative predictors	R^2
Ln SBP	346	Age, Calf girth	0.35
Ln DBP	346	Age, Age^2, Stature, Alcohol intake	0.31

Both R^2 values are significant at 5% level

TABLE 5
ADJUSTED MEAN SYSTOLIC AND DIASTOLIC BLOOD PRESSURES, BY AREA OF RESIDENCE AND EDUCATIONAL STATUS

	Systolic blood pressure		Diastolic blood pressure	
	X	SE	X	SE
Area of residence				
Rural (n = 208)	127.91	1.01	85.46	1.01
Urban (n = 138)	131.33	1.01	90.68	1.01
Educational status				
Illiterate (n = 103)	126.65	1.01	85.12	1.03
Primary (n = 82)	130.71	1.01	87.08	1.01
Middle (n = 58)	127.27	1.02	87.36	1.03
Secondary (n = 62)	134.15	1.02	92.28	1.03
Higher (n = 41)	128.80	1.02	87.56	1.02

TABLE 6
FREQUENCY DISTRIBUTION OF HYPERTENSIVE SUBJECTS, BORDERLINE CASES AND NORMOTENSIVE SUBJECTS BY GENDER AND AREA OF RESIDENCE

	Rural						Urban					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Hypertensive	37	31.90	23	25.00	60	28.85	23	31.94	18	27.27	41	29.71
Borderline cases	16	13.79	8	8.70	24	11.54	15	20.83	11	16.67	26	18.84
Normotensive	63	54.31	61	66.30	124	59.61	34	47.22	37	56.06	71	51.45
Total	116	100.00	92	100.00	208	100.00	72	99.99	66	100.00	138	100.00

groups higher percentages of hypertensives and borderline cases are found among the males compared to females. A consistent trend showing higher percentages of hypertensives and borderline cases, in the urban group compared to the rural group among both the genders is noticeable.

Much higher percentages of hypertensives and borderline cases are thus classified owing to contribution of elevated diastolic pressure only, irrespective of gender and area of residence (Table 7).

Discussion

The present microlevel study, among the Buddhist Lepcha adults inhabiting both urban and rural areas of Sikkim Himalaya, reveals that Lepchas have elevated blood pressure levels. Consequently, the prevalence of essential hypertension (as judged by WHO criteria) is high among the Lepchas. It has also been observed that diastolic hypertension was the most common type, as found elsewhere as well[39]. Age effect on blood pressure is found to be significant, as is generally observed in modernized or recently acculturated populations[40]. However, it is surprising to observe that significant gender effect is not discernible though males consistently show higher mean values of SBP and DBP, irrespective of area of residence.

Of the anthropometric variables considered, calf girth and stature are found to be significant predictors of SBP and DBP, respectively. Admittedly, it is rather difficult to explain the biological meaning of statistical association between calf girth and blood pressures; while significant association between stature and blood pressures could be indicative of role of body size in predicting blood pressures. It is to be noted that adiposity and/or obesity, believed to play important roles in elevating blood pressure levels in many populations, do not seemingly influence blood pressure in the population studied.

Disease status shows significant effect only on SBP. Expectedly, diseased (those who reportedly suffer from hypertension and/or chest pain) individuals had higher mean SBP value compared to those who do not suffer from such ailments that are known to be associated with high levels of blood pressure.

Surprisingly, most of the behavioral traits considered in the study viz., smoking, tobacco chewing, salt intake and oral contraceptive use do not show any significant effect on blood pressures. It is difficult to offer an explanation for such a

TABLE 7
FREQUENCY DISTRIBUTION OF CATEGORIES OF HYPERTENSIVE SUBJECTS AND BORDER LINE CASES, BY GENDER AND AREA OF RESIDENCE

Category	Rural						Urban					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Both systolic and diastolic pressures (SBP 160 & DBP 95)	10	27.03	6	26.09	16	26.67	4	17.39	4	22.22	8	19.51
Systolic pressure only (SBP 160)	0	0	0	0	0	0	1	4.35	0	0	1	2.44
Diastolic pressure only (DBP 95)	27	72.97	17	73.91	44	73.33	18	78.26	14	77.78	32	78.05
All combined	37	100.00	23	100.00	60	100.00	23	100.00	18	100.00	41	100.00
Border line cases												
Both systolic and diastolic pressures	4	25.00	2	25.00	6	25.00	3	20.00	4	36.36	7	26.92
Systolic pressure only	1	6.25	1	12.50	2	8.33	1	6.67	1	9.09	2	7.69
Diastolic pressure only	11	68.75	5	62.50	16	66.67	11	73.33	6	54.55	17	65.39
All combined	16	100.00	8	100.00	24	100.00	15	100.00	11	100.00	26	100.00

finding. However, the only behavioral trait that significantly affects blood pressure, then too, only DBP, is alcohol intake. That there exists a positive relationship between alcohol intake and blood pressure has been documented in many studies[41,42].

When we turn to examine the effects of sociocultural factors (i.e. area of residence and education) on blood pressure, it provides a relatively clearer picture. Both these factors are significantly associated with blood pressures. The urban group shows higher mean values of both SBP and DBP, compared to their rural counterparts. A trend, though not absolutely uniform, of an increase in the level of SBP and DBP with increase in the level of education is also observed (Table 5). Rural-urban difference in respect of blood pressure as well as hypertension have been demonstrated by various studies and their findings often indicate that urban groups have higher blood pressure and higher prevalence of hypertension compared to rural groups[2,31,43]. Again the present finding of a positive association between education and blood pressure is in conformity with some other studies[29,45].

Factors responsible for a generally high level of blood pressure and high prevalence of essential hypertension in the study population could be many. Identification and

assessment of relative importance of all such factors are not possible with the types of data we have analyzed. However, it can be suggested that regular consumption of alcoholic beverages play an important role in elevating blood pressure level and raising prevalence of essential hypertension.

It seems that in the study population, better educated individuals with a relatively higher proportion of them living in the urban area and having been primarily engaged in non-agricultural occupation, are exposed to a competitive environment, which generates stressful life situations, compared to their agriculturist, less educated rural counterparts. This phenomenon may consequently lead to higher blood pressures among the urban individuals compared to the rural ones as evident also in some other populations.

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KRVNI TLAK I NJEGOVI BIOKULTURNI KORELATI U SIKKIMSKIH LEPCHA, INDIA: MIKRO-EPIDEMIOLOŠKA STUDIJA

S A Ž E T A K

Ova studija daje profil krvnog tlaka u budističkih Lepcha, plemenske populacije porijeklom sa Sikkima, Himalaje, u odnosu na odabrane biološke i socio-kulturne čimbenike te one vezane uz način života. Ispitanici (dobi od 16 godina i stariji) izabrani su na način da dio uzorka čine stanovnici Gangtoka, glavnog grada Sikkima, dok drugi dio uzorka čine stanovnici sela Dzongu (oko 75 km sjeverno od Gangtoka). Ispitanici iz urbane sredine zaposleni su primarno u uslužnoj djelatnosti, dok se oni koji stanuju u ruralnom području bave zemljoradnjom. Ovi rezultati pokazali su značajan dobni trend krvnog tlaka (na log-transformiranim podacima), međutim, utjecaj spola nije bio značajan. Među ispitivanim antropometrijskim varijablama značajnu povezanost i sa sistoličkim i dijastoličkim krvnim tlakom pokazali su opseg potkoljenice i tjelesna visina. Zdravstveno stanje (pristustvo bolesti kardio-respiratornog sustava ili dijabetesa) pokazalo je značajnu povezanost s visinom sistoličkog krvnog tlaka, dok je konzumacija alkohola imala selektivni učinak samo na vrijednosti dijastoličkog krvnog

tlaka. Nadalje, pokazalo se kako na vrijednosti oba krvna tlaka značajan učinak ima mjesto stanovanja (selo ili grad) kao i stupanj obrazovanja. Srednji sistolički i dijastolički krvni tlak urbanih Lepcha bio je značajno viši u odnosu na ruralnu kontrolu. Porast u srednjim vrijednostima i sistoličkog i dijastoličkog krvnog tlaka s porastom stupnja obrazovanja, zamjetan je, no ovaj trend nije apsolutno jednoznačan.

TABLE 3A
RBAN SUBSAMPLE: DESCRIPTIVE STATISTICS PERTAINING TO QUANTITATIVE VARIABLES BY GENDER AND AREA OF RESIDENCE

ble	Male				Female				Total			
	N	X	SD	Range	N	X	SD	Range	N	X	SD	Range
ears)	72	34.43	12.55	16–69	66	33.45	12.78	16–83	138	33.96	12.63	16–83
ic Blood Pressure g)	72	132.35	16.96	107–188	66	130.02	18.75	91–183	138	131.23	17.81	91–188
olic Blood Pressure g)	72	91.86	10.72	71–129	66	88.47	11.94	61–119	138	90.24	11.41	61–129
rate	72	76.47	8.63	60–98	66	81.18	8.70	60–102	138	78.72	8.95	60–102
t (kg)	72	57.91	8.69	45.0–80.0	66	55.36	9.61	40.0–90.0	138	56.69	9.20	40.0–90
e (cm)	72	158.82	5.20	148.3–171.9	66	149.86	5.86	131.0–167.8	138	154.53	7.10	131.0–17
arm girth (cm)	72	25.73	2.52	19.0–30.6	66	25.38	3.01	20.6–36.8	138	25.56	2.76	19.0–36
irth (cm)	72	32.99	2.31	28.5–37.7	66	32.41	2.54	28.8–41.0	138	32.71	2.43	28.5–41
s skinfold (mm)	72	9.13	3.70	4.3–19.8	66	17.55	7.22	5.4–38.0	138	13.16	7.05	4.3–38.
apular skinfold (mm)	72	16.52	9.44	6.2–42.0	66	27.90	9.84	7.4–48.0	138	21.96	11.16	6.2–48.
mass index ^{2}: kg/m^2)	72	22.96	3.29	17.8–30.5	66	24.64	4.00	18.5–38.3	138	23.76	3.73	17.8–38
of relative subcuta- fat distribution[a]	72	0.62	0.74	0.45–0.78	66	0.61	0.07	0.31–0.75	138	0.62	0.07	0.31–0.7
ng[b]	6	5.50	3.83	2–12	3	3.33	0.57	3–4	9	4.78	3.23	2–12
co chewing[c]	21	10.81	5.24	2–20	4	7.00	3.83	2–10	25	10.20	5.17	2–20
ol intake[d]	17	2.06	0.83	1–4	11	1.82	0.87	1–3	28	1.96	0.84	1–4
tea intake[e]	72	2.22	2.10	1–10	66	2.55	1.87	1–9	138	2.38	1.99	1–10

of subscapular skinfold to the sum of triceps and subscapular skinfolds; [b] No. of cigarettes smoked / day; [c] No. of times tobacco chew
No. of alcoholic drinks / day; [e] No. of cup of tea, added with salt consumed / day.

TABLE 3B
RURAL SUBSAMPLE: DESCRIPTIVE STATISTICS PERTAINING TO QUANTITATIVE VARIABLES BY GENDER AND AREA OF RESIDENCE

ble	Male				Female				Total			
	N	X	SD	Range	N	X	SD	Range	N	X	SD	Range
ears)	116	38.35	14.80	19–82	92	35.79	11.58	20–67	208	37.22	13.50	19–82
ic Blood Pressure Hg)	116	131.64	19.97	99–230	92	128.01	18.35	98–188	208	130.03	19.31	98–23
olic Blood Pressure Hg)	116	88.96	14.64	59–141	92	85.18	13.10	60–119	208	87.29	14.07	59–14
rate	116	78.93	9.88	58–104	92	83.65	9.22	64–108	208	81.02	9.86	58–10
t (kg)	116	60.49	8.47	40.0–86.0	92	51.45	7.82	35.5–95.5	208	56.49	9.33	35.0–95
re (cm)	116	161.19	5.55	146.5–175.6	92	148.28	4.99	135.6–159.1	208	155.48	8.33	135.6–17
arm girth (cm)	116	25.98	2.43	20.5–32.3	92	24.22	2.27	18.0–35.5	208	25.20	2.51	18.0–35
irth (cm)	116	34.08	2.75	23.1–41.0	92	30.71	2.28	25.8–42.0	208	32.59	3.05	23.1–42
s skinfold (mm)	116	7.58	3.61	3.4–32.4	92	11.14	3.21	3.6–18.6	208	9.16	3.86	3.4–32
apular skinfold (mm)	116	12.85	7.62	4.8–38.4	92	13.07	4.52	5.4–40.8	208	12.95	6.42	4.8–40
mass index ^{2}: kg/m^2)	116	23.28	3.07	15.1–34.5	92	23.34	2.86	17.1–39.5	208	23.31	2.97	15.1–39
of relative subcuta- fat distribution[a]	116	0.62	0.06	0.41–0.79	92	0.54	0.08	0.29–0.73	208	0.58	0.08	0.29–0.
ing[b]	5	8.20	9.63	2–25	3	8.33	4.73	3–12	8	8.25	7.70	2–25
co chewing[c]	34	6.12	3.80	3–20	15	7.53	4.64	3–20	49	6.55	4.08	3–20
ol intake[d]	71	2.56	1.41	1–8	56	2.18	2.38	1–18	127	2.39	1.90	1–18
d tea intake[e]	77	2.23	2.10	1–10	65	3.14	1.68	1–7	142	2.64	2.00	1–10

of subscapular skinfold to the sum of triceps and subscapular skinfolds; [b] No. of cigarettes smoked / day; [c] No. of times tobacco chew
No. of alcoholic drinks / day; [e] No. of cup of tea, added with salt consumed / day.