

# A Study on Blood Pressures between the Tibet Born and India Born Tibetans Who are Permanently Residing in Northern India

Sanjukta Bera

Department of Anthropology, Vidyasagar University, West Bengal, India

## ABSTRACT

*Both systolic and diastolic blood pressures are generally believed to vary in relation to various factors like sex, age, body build, altitude, socio-economic condition, chronic diseases, etc. but the evidences are not always unequivocal. This paper aims to study the effect of intergenerational change, age, sex, and body mass index on blood pressures and to see the effects of migration on blood pressures among the two generations of the Tibetan immigrants in Northern India. Findings from research on 1<sup>st</sup> and 2<sup>nd</sup> generation adult Tibetans indicate that there are no significant differences in blood pressures between two generations in both the sexes which may have contributed to their food habits.*

**Key words:** blood pressures, food habits, Tibetans, India

## Introduction

Blood pressures are generally believed to vary in relation to various factors like sex, age, anthropometric measures of body build, altitude, socio-economic condition, ethnic groups, etc.<sup>1,2-3,4-5</sup> but the evidences are not unequivocal<sup>6,7</sup>. Most studies on blood pressure reported an increase of both systolic and diastolic blood pressures with age have been done on many populations. It has also been suggested that age related increase of blood pressure is not a necessary part of individual's aging process<sup>8</sup>, socio-cultural differentials among populations have been responsible to a great extent for varying levels of blood pressures among them. Here modernization provides additional evidence that rapid sociocultural change is associated with increased prevalence of hypertension<sup>9</sup>.

Several studies have found that elevated blood pressure, which is associated with increased morbidity and mortality, is known to be related to several aspects of the modern lifestyle, including the western diet, lack of exercise, and increased psychological stress<sup>10,11</sup>. It is evident that cultural change has an influence on blood pressures in social groups migrating to new settings<sup>12</sup>.

In the present study, we have considered the 1<sup>st</sup> (Tibet born Tibetans who migrated to India) and 2<sup>nd</sup> (India born Tibetans) generation Tibetan immigrants of Northern

India to see the effect of intergenerational change (based on place of birth), age, sex, and BMI on their blood pressures and to see the changes associated with the migration to alien environment i.e., psychological trauma due to displacement, changes in socio-cultural milieu as well as living in more urbanized setting compared to their original homeland or in other word changes in life style and their impact on blood pressures.

## Materials and Methods

### *Area and population*

The present study has been conducted among the Tibetans of northern India. Two groups of Tibetan populations – one Tibet born Tibetans (TBT) and the other India born Tibetans (IBT) – have been selected as 1<sup>st</sup> and 2<sup>nd</sup> generation Tibetan immigrants from two different places of Northern India; one from Deradun district of Uttar Pradesh (now under Uttaranchal State of India) situated at 640 meters above sea level and other is from Dharamsala of Kangra district of Himachal Pradesh situated at a height of about 1,500 meters from the mean sea level (the town extends up to about 1,900 meters). The Ti-

betans of these two settlements are descended from the same Tibetan stock and they have lived in India more than 40 years (migrated in India around 1960's). Most of the parameters (for example, mean age at menarche, mean age at marriage, average live birth/woman, educational status) between the settlements are not significantly different. Therefore, the Tibetan populations of these two settlements were combined and presented as a representative homogeneous sample of the Tibetans of North India.

The Tibet born Tibetans are high altitude native of Tibet (average elevation of 4,500 meter above sea level from where they came to India), a section of which migrated to lower altitudes in India in the 1960s. The India born Tibetans (IBT) are originally Tibetans whose ancestors lived in Tibet but they are born and brought up at lower altitudes in India and at present share similar geographical locations with the TBT who migrated to India. It would be difficult to measure the effect of migration on blood pressures among them, since there is no data available on when during their life the TBT migrated to India. Therefore, in the present study a comparison between TBT and IBT has been made as a proxy between 1<sup>st</sup> and 2<sup>nd</sup> generation Tibetan immigrants, where an attempt has been made to see the intergenerational effects of migration on blood pressure.

The adult male and female Tibetans were selected from both the subgroups for the present study. Of the 317 individuals examined, 256 were included in the present analysis (since there were no individuals found above the age of 45 years among the India born Tibetans (IBT), the analysis was done up to 45 years age among both the groups). These 256 subjects range in age from 20–45 years and were fairly evenly distributed between the sexes and their places of birth (40, 73 TBT and 46, 87 IBT; males and females, respectively). Difficulties were encountered in the assessment of age as only a few households kept written records of dates of birth. They follow Tibetan animal element calendar instead of Gregorian calendar which was converted to nearest date of Gregorian calendar. The age was estimated by reference of some important local events. These were further cross-checked from a number of elderly individuals on subsequent visits.

#### *Anthropometric and blood pressure measurements*

The data on systolic and diastolic blood pressures, and two anthropometric measurements (height and weight) were utilised in the present report. Anthropometric measurements were taken by author using standard anthropometric techniques<sup>13</sup>. Height and weight were measured to the nearest 0.1 cm and 0.5 kg using Martin's anthropometer and weighing scale, respectively. Both for height and weight, subjects were requested to remove their shoes prior to taking measurements. Body mass index (BMI) was computed following the standard formula<sup>14</sup>;

$$\text{BMI (kg/m}^2\text{)} = \text{Weight (kg)} / \text{Height}^2 \text{(m}^2\text{)}.$$

Blood pressures of the subjects were taken after about a 15 minutes' rest period using an inflatable blood pressure cuff, sphygmomanometer and a stethoscope by employing auscultatory method. The subject was asked to sit on a stool or a flat raised platform, resting left arm on a table or on a flat place at heart level.

#### *Statistical analyses*

Technical errors of measurements (TEM) were computed following the standard method recommended by Ulijaszek and Kerr<sup>15</sup>. Since TEM's were found to be within acceptable limits, they were not incorporated in statistical analyses.

In the present analysis, two generations of the Tibetans (TBT and IBT) have been pooled as one large sample to measure the effect of intergenerational change (change in place of birth), age, sex, and BMI on blood pressures. For this, a multiple regression procedure was employed to measure blood pressure change with place of birth, age, sex, and BMI as the independent variables in the regression model. In a further analysis, two generations have been considered as two separate samples. A multivariate multiple regression approach was used in which separate regression model was developed for each generation and the multivariate relationships of blood pressures with age, sex, and BMI were compared between them. Statistical significance in these models was set at  $p < 0.05$ . Data were entered and analyzed using SPSS/PC with Windows®.

## **Results**

The mean and standard deviations of age, height, weight, body mass index (BMI) and blood pressures for both the generations of the Tibetans have been presented in Table 1. In males, both the systolic (SBP) and diastolic blood pressures (DBP) and BMI tend to be higher among the IBT than the TBT. In contrast, in females, SBP and DBP and BMI are higher among the TBT than the IBT but the differences are not significant in both the cases. Thus, blood pressures have been found to be higher in both the generations with increasing BMI (Table 1).

The results of multiple regression analysis (Table 2) show that age, sex, and BMI are associated with both the blood pressures (SBP and DBP) among all Tibetans, while intergenerational change (based on their place of birth) shows a significant association only with diastolic blood pressure among them.

Regression results by generation for blood pressures indicate that BMI is significantly associated with both blood pressures in both the generations (Table 3). Results further demonstrate that age is associated with blood pressures (SBP and DBP) only in TBT, while sex has a significant relation with blood pressures only in IBT.

## Discussion

Despite difference in place of birth, blood pressures between the two generations of the Tibetan population in India show some similarities. No significant differences have been found in blood pressures between two samples in both the sexes though blood pressures tend to be higher among females in the 1<sup>st</sup> generation than the 2<sup>nd</sup> generation. Additionally, in both the samples, BMI is significantly correlated with blood pressures.

In the light of the above findings it may be conjectured that there exist some effects of migration on blood pressures, including differences in food habits<sup>16</sup>, and stress associated with displacement<sup>17</sup>. The effect of BMI on blood pressures<sup>18,19</sup> and the effects of differential levels of physical activity pattern on blood pressures<sup>20,21</sup> may also have some impact.

The nature of dietary and stress differences, and their impact on blood pressure were not investigated as part of this study. However, it can be noted that diet of the TBT in Northern India consisted of high protein and fat. The salt intake among the TBT is comparatively low than the native Tibetans in high altitude, where the Tibetans were reported to consume a large amount of salt, chiefly in the form of salt-flavoured tea<sup>22</sup>. The dietary characteristic of the Tibetans was found to be the cause of high prevalence of hypertension among the high altitude Tibetans in Tibet<sup>22</sup>. In India, salt intake is comparatively

**TABLE 1**  
MEAN AND STANDARD DEVIATIONS OF AGE, BMI AND BLOOD PRESSURES: TWO GROUPS (GENERATIONS ARE USED) OF THE TIBETANS

	Adult Males	
	TBT (Migrated from Tibet to India)	IBT (Offspring of the TBT)
	N=40 X±SD	N=46 X±SD
Age	35.33±5.71	32.80±5.70
Height	167.83±6.65	165.88±6.88
Weight	65.74±11.34	65.19±11.39
BMI	23.25±3.19	23.65±3.56
Systolic	110.13±14.06	114.35±10.82
Diastolic	69.43±12.66	74.11±9.90
	Adult Females	
	N=73	N=87
Age	34.12±6.07	30.36±5.48
Height	155.70±5.54	153.63±4.54
Weight	59.83±10.47	55.37±8.86
BMI	24.64±3.82	23.56±3.64
Systolic	106.78±14.32	103.30±10.35
Diastolic	67.86±11.75	66.36±10.23

BMI – body mass index

**TABLE 2**  
REGRESSION ANALYSES FOR BLOOD PRESSURES OF ALL TIBETANS

Predictor Variables	Systolic (SBP)				Diastolic (DBP)			
	B	SeB	Beta	t	B	SeB	Beta	t
Generations of a Population	1.279	1.514	0.049	0.844	2.766	1.339	0.122	2.065*
Age	0.423	0.129	0.197	3.277**	-4.624	1.368	0.246	4.052***
Sex	-7.390	1.547	-0.273	-4.778***	0.463	0.114	-0.195	-3.380**
BMI	1.167	0.205	0.327	5.703***	1.009	0.181	0.323	5.571***

B – sample regression coefficient, SeB – standard error of B, Beta – estimated population regression coefficient, BMI – body mass index  
Sex coded as 1 for male and 2 for female, generations coded as 3 for TBT and 4 for IBT

Significant \*\*\* p<0.0005, \*\* p<0.002, \*p<0.05

**TABLE 3**  
REGRESSION COMPARISONS OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURES BY GENERATION

Predictor Variables	Systolic (SBP)							
	TBT (N=113)				IBT (N=133)			
	B	SeB	Beta	t	B	SeB	Beta	t
Age	0.612	0.200	0.255	3.062**	0.223	0.161	0.108	1.386
Sex	-4.803	2.491	-0.162	-1.928	-10.434	1.880	-0.425	-5.551***
BMI	1.580	0.329	0.405	4.797***	0.763	0.248	0.234	3.074**
Predictor Variables	Diastolic (DBP)							
	B	SeB	Beta	t	B	SeB	Beta	t
Age	0.608	0.165	0.301	3.686***	0.309	0.155	0.163	1.997*
Sex	-2.736	2.058	-0.109	-1.330	-6.937	1.805	-0.308	-3.844***
BMI	1.373	0.272	0.417	5.046***	0.659	0.238	0.221	2.765**

Sex coded as 1 for male and 2 for female, BMI – body mass index

Significant \*\*\* p<0.0005; \*\* p<0.002; \*p<0.05

low among the TBT, since they also like to take sugar-flavoured tea with salt-flavoured tea like the IBT. Thus, a low intake of sodium among the TBT in India may play a role in relatively low blood pressures among them. That there is no significant difference in blood pressures found between the TBT and IBT, may be contributed to the similar food habits among them.

Our results however show a tendency of higher blood pressures among the TBT than the IBT only in females. An increased prevalence of over weight among the women in the TBT may be the leading cause of higher blood pressures in the TBT females. A significant influence of BMI on blood pressures is the probable explanation behind it. Increased levels of physical inactivity<sup>20,21</sup> as well as higher intake of calorie that are too high in relation to physical activity levels are possible causes for the higher prevalence of overweight<sup>23</sup>. Higher intake of protein and

fat rich food with sedentary nature of work leads to obesity which may in turn leads to higher blood pressures among the TBT in India.

Additionally psychological stress due to displacement may have some effect on differentials in blood pressures. Further studies are needed to unravel the above causes in differentials in blood pressures.

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S. Bera

634 Block – O, New Alipore, Kolkatta 700053, West Bengal, India  
e-mail: sanjukta\_bera@yahoo.com

## ISTRAŽIVANJA KROVOG TLAKA TIBETANACA ROĐENIH NA TIBETU I U INDIJI SA PREBIVALIŠTEM U SJEVERNOJ INDIJI

### SAŽETAK

Opće je prihvaćeno da sistolički i dijastolički krvni tlak variraju ovisno o različitim čimbenicima kao što su spol, dob, tjelesna građa, socio-ekonomski status, kronične bolesti i sl., ali dokazi nisu uvijek nedvosmisleni. Cilj ovog rada bio je ustanoviti utjecaj međugeneracijske promjene, dobi, spola i indeksa tjelesne mase na vrijednosti krvnog tlaka i ustanoviti utjecaj migracija na razlike među vrijednostima krvnih tlakova između dvije generacije tibetanskih imigranata u sjevernu Indiju. Rezultati istraživanja na prvoj i drugoj generaciji odraslih Tibetanaca pokazuju da ne postoje značajne razlike u vrijednostima krvnih tlakova između dvije generacije kod oba spola, što upućuje na utjecaj prehrambenih navika.