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Association between Obesity and Blood Pressure with certain lifestyle as risk factors among Chiru Males of Northeast India

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KEYWORDS

Anthropometric, BMI, Chiru, hypertension, Manipur, Obesity, and overweight

ABSTRACT

Hypertension and obesity are among the most prevalent non-communicable diseases, which significantly and independently increase the risk of developing cardiovascular diseases causing high morbidity and mortality worldwide. It has become the most neglected blatantly visible health challenge, reducing the overall quality of life. The study was an attempt to investigate the prevalence of hypertension, general obesity and to determine the lifestyle risk factors for hypertension among the Chiru Male of Manipur. The results indicated that BMI and blood pressure were significantly associated and among lifestyle factors, physical activity and smoking have the most substantial influence on hypertension.

Introduction

Hypertension and obesity have been well established modifiable risk factors for developing cardiovascular diseases (CV), respiratory disease, cancer, arthritis, gout, and diabetes. There has been a rapid increase in obesity-related disorders in the last few decades, leading to the loss of human life and establishing enormous challenges worldwide in the global health scenario. The World Health Organization (WHO, 2012) has reported that one in six adults are obese and about 2-8 million individual deaths occur due to overweight or obesity every year worldwide. Due to its higher rate of morbidity and mortality risk factors, obesity is sometimes considered a disease (Gandhi *et al*., 2020). The increasing prevalence of obesity suggests that a sedentary lifestyle may be one of the critical determinants of increased overweight and obesity. Thus, overweight and obese have reached an epidemic-like nature in both developed and developing countries.

Similarly, hypertension has become a serious global health issue posing major public health challenges in the 21st century due to asymptomatic or no warning signs that led people to ignore it consciously. It is the fourth and seventh leading cause of premature death in developed and developing countries (Rao *et al*., 2013; Kulkarni, 1998). World Health Statistic 2012 (WHO, 2012) reported that one in three adults worldwide is hypertensive. According to the World Health Organization (WHO, 2015), the prevalence of high blood pressure in adults aged 18 above has significantly increased from 22.9 % (23.4% male and 22.3% females) 2010 to a higher rate of 25.9 % in just four years (accounting for 25.4% in males and 24.8% in females) in 2014. This statistic shows that the world's second-largest population faces one of the biggest health challenges with rapid advancement in factories, urbanization, sedentary lifestyle, improved socio-economic condition, and overall improvement in every aspect of life (Das *et al*., 2014). Recent studies (Anchala *et al*., 2014; Satheesh *et al*., 2017; Singh *et al*., 2017) have shown an increase in the predominance of hypertension which is also a matter of great concern. It is also estimated to increase the

prevalence rate of hypertension to 29.2% (approximately 1.56 billion) by 2025 (Murray and Lopez, 1997).

In India, tribal populations contribute a substantial percent of 104.3 million of the population, constituting 8.6% of the total population of 1.21 billion (Census of India, 2011; Mahapatra and Ray, 2021). At present, 697 tribes are recognized by the Union government as per article 342 of the Indian Constitution (Mahapatra and Ray, 2021). Perhaps, only a few tribes in the northeast region of India have been explored despite the diversity in terms of biological and socio-cultural backgrounds. There are 33 recognized scheduled tribes in Manipur state with a total population of 902740 (Census of India, 2011). However, only a few handfuls of studies have been reported on the assessment of hypertension, nutritional status among the tribes of Manipur (Mungreiphy *et al*., 2011; Mungreiphy *et al*., 2012; Lalnuneng and Khongsdier, 2017; Khual and Limbu, 2019).

Therefore, keeping in perspective of numbers of tribes that are yet unexplored and uncovered on many clinical and epidemiological research studies among the tribal population of Manipur. Hence, in this present study, an adult Chiru Male from the Chiru tribal community, belonging to a scheduled tribe residing in the hill districts of Manipur, was selected as this tribe is yet to explore any obesity and lifestyle indicators in the etiology of hypertension. Thus, the present study aims to estimate the association between hypertension and general obesity and to determine the risk factors of hypertension among the Chiru Male of Manipur.

Study Area and People

The Chiru tribe is one of the indigenous tribes of North East India and mainly inhabits Manipur and Assam states. Chiru tribe has been recognized as a scheduled tribe by the government of India since 1950. The term 'Chiru" is derived from the historical settlement site 'Chibu' presumably a spot or area in China. This tribe is also known as 'Reiim', which means simple man (Thanglen, 2015). The Chiru show predominantly mongoloid features and speaks their own Chiru language of the Tibeto-Burman linguistic family. The Chiru show a great affinity with other tribes like Aimol, Anal, Bete, Chothe, Hmar, Hallam, Koireng, Kom, Puimei, Mayon, Mongsang, Maring, Rangkhol, Lamgang, and Tarao. (Hudson, 1911). They are mainly agriculturists and practice Jhum cultivation as the primary source of income. Data were collected from 4 different Chiru villages viz. Kangchup, Dolang, Charoi Khullen, and Khoirok.

Materials and Methods

A cross-sectional sample size of 209 adult Chiru males, ranging in age from 20-79 years, was collected from 4 Chiru villages using a simple random sampling method. Anthropometric measurements such as height and weight required for body mass index calculation were measured using the most accepted standard technique (Weiner and Lourie, 1969). Height was measured to the nearest 0.1 cm by anthropometer, and body weight was measured using the portable weighing machine to the nearest 0.1 kg without shoes and light clothing. The physiological variable of blood pressure was recorded using a standard mercury sphygmomanometer and a stethoscope (Beever *et al*., 2001). The mean of three readings was taken at five minutes intervals. Each subject's blood pressure was recorded on the left arm for uniformity while the subject was seated. Blood pressure of systolic and diastolic was classified following the 7th Report of the Joint National Committee (JNC) on Prevention, Detection, Evaluation, and the Treatment of High Blood Pressure. However, for the diagnosis of hypertension criteria with a reading of systolic blood pressure (SBP) ≥ 140 mmHg, Diastolic blood pressure (DBP) ≥ 90 mmHg. Body mass index (BMI) is evaluated as the body weight in kilograms divided by the square of the height in meters and expressed in kg/m^2. Nutritional status was classified according to the WHO recommendations for the Asia populations based on BMI (kg/m^2) as

underweight (BMI<18.5), normal (BMI=18.5-22.9), overweight (BMI=23.0-27.5), and obese (BMI≥27.5).

All the lifestyle risk factors were collected as per the (WHO) STEP wise approach to the (NCD) risk factors surveillance guideline (WHO, 2017). As for information on tobacco consumption, each participant was categorized as Tobacco users and non-tobacco users. Tobacco users are those who use tobacco products regularly or at least once a day. In the same way, smokers are those participants who smoke regularly or at least once a day. Pan users are those who have the habit of chewing pan regularly or almost every day. The consumption of alcohol was also collected from each individual and categorized as alcoholic and non-alcoholic. Alcoholics are those who consume/drink alcohol daily or on every occasion. The dietary salt intake was also collected from each participant and categorized as extra salt and no extra salt. The average daily consumption of salt in grams per person per day was evaluated from the total monthly consumption divided by the family size and then by 30. As per (JNC) has recommended a daily intake of salt is 6 g per day (Chobanian *et al*., 2003).

Information on physical activity was also collected from each individual using the (WHO) Global Physical Activity Questionnaire (GPAQ) based on the recalled method of one week (WHO, 2005; Bull et al., 2009). According to World Health Organization (WHO) recommendation, physical activity for the present study was classified as Physically Active and Physically Inactive. Physically active are those individuals with moderate and vigorous-intensity physical activity achieving at least 600 MET-minutes. Whereas physically inactive are those individuals who did not meet the 600 MET-minutes.

Statistical Analysis

The total sample size was categorized into six different age groups as 20-29(years), 30-39(years), 40-49(years), 50-59(years), 60-69(years), and 70-79(years) for further analysis. Descriptive statistics of the mean ($\bar{x}$) and standard deviation (±SD) were evaluated to describe age, height, weight, BMI, and other continuous independent variables. The χ^2 test was also employed to assess the interrelationship between age groups and prevalence of nutritional status and blood pressure. Pearson correlation analysis was calculated to examine the relationship between BMI, blood pressure, age, and other modifiable lifestyle factors. Binary logistic regression of odd unadjusted ratio was calculated to examine lifestyle risk factors' impact on high blood pressure with a significant level at $p<0.05$,$p<0.01$, and $p<0.001$. All statistical analyses were undertaken using the SPSS Statistical packages (version 20.0).

Results

Table 1: Age group-wise descriptive statistics (Mean±SD) of anthropometric and derived measurements among the participants of Chiru Males of Manipur

Age Group	Stature			Bodyweight		Body Mass Index	
	N	Mean ($\bar{x}$)	±SD	Mean ($\bar{x}$)	±SD	Mean ($\bar{x}$)	±SD
20-29	45	159.45	5.20	55.57	7.34	21.84	2.68
30-39	39	159.25	5.91	59.76	9.09	23.53	3.14
40-49	33	158.24	4.38	59.30	9.80	23.59	3.08
50-59	35	158.05	5.58	58.69	9.55	23.38	3.20
60-69	36	157.16	5.53	58.36	9.32	23.56	3.18
70-79	21	157.09	4.99	52.00	7.94	21.10	3.30
Total	209	158.36	5.29	57.58	9.09	22.91	3.17

Table 1 displays the descriptive statistic of height, body weight, and body mass index of Chiru males in six different age groups. The overall mean value for stature, body weight, and body mass index was (158.36± SD 5.29), (57.58± SD 9.09), and (22. 91± SD 3.17), respectively. The highest and lowest mean value for stature among the Chiru tribe was found in 20-29 (159.45± SD 5.20) and 70-79(157.09± SD 4.99) years. Stature showed a distinct decreasing trend from the youngest age group to the oldest age group. Bodyweight shows an increasing trend up to 40-49 years with minor fluctuation in the age group of 30-39 years. The maximum and minimum bodyweight was found in the age group of 30-39 (59.76± SD 9.09) and 70-79 (52.00± SD 7.94). The maximum mean value for BMI resulted from 40-49 years (23.59± SD 3.08) while the minimum BMI was (21.10± SD 3.30) found among 70-79 years. BMI increased with age until 40-49 and decreased after a minor fluctuation in 50-59 and 60-69.

Table 2: Age group-wise descriptive statistics (Mean±SD) of physiological measurements among the participants of Chiru Males of Manipur

Age Group	Systolic (mmHg)			Diastolic (mmHg)	
	N	Mean ($\bar{x}$)	±SD	Mean ($\bar{x}$)	±SD
20-29	45	112.88	11.40	73.31	11.04
30-39	39	112.56	10.93	73.58	10.12
40-49	33	115.75	12.19	76.96	9.83
50-59	35	121.42	17.00	80.85	12.91
60-69	36	133.27	23.93	81.38	13.34
70-79	21	138.57	24.95	83.80	12.83
Total	209	120.90	19.17	77.65	12.15

Table 2 describes the systolic and diastolic blood pressure in six different age groups of Chiru males. The systolic and diastolic blood pressure shows an increasing trend from the lowest age group to the highest age group, although there is a minor fluctuation in the age group of 20-29 years. The maximum mean value of systolic and diastolic blood pressure was found in the age groups of 70-79 years (138.57 ± SD 24.95) and (83.80 ± SD 12.83), respectively. However, the minimum mean value of systolic and diastolic blood pressure was found in the age group of 30-39 (112.56 ± SD 10.93) years and 20-29 years (73.31± SD 11.04), respectively. The overall mean value for systolic and diastolic blood pressure was (120.90 ± SD 19.17) and (77.65 ± SD 12.15) respectively.

Table 3: Age-wise distribution of Chiru Males in different categories of obesity marker of Body Mass Index

BMI Classification	Age group						Total	Freq.%	$\chi 2$
	20-29	30-39	40-49	50-59	60-69	70-79			
Under-weight	2	2	0	1	2	4	11	5.3%	18.932
	18.2%	18.2%	0.0%	9.1%	18.2%	36.4%	100%		
Normal	29	16	16	18	15	11	105	50.2%	
	27.6%	15.2%	15.2%	17.1%	14.3%	10.5%	100%		
Overweight	11	18	14	12	14	5	74	35.4%	
	14.9%	24.3%	18.9%	16.2%	18.9%	6.8%	100%		
Obese	3	3	3	4	5	1	19	9.1%	
	15.8%	15.8%	15.8%	21.1%	26.3%	5.3%	100%		
Total	45	39	33	35	36	21	209	100.0	
	21.5%	18.7%	15.8%	16.7%	17.2%	10.0%	100%		

Table 3 shows the prevalence of general obesity (BMI) in different age groups of Chiru males. The highest frequency distribution of underweight individuals (36.4%) and normal (27.6%) were found in age groups of 70-79 and 20-29 years respectively, whereas overweight was most prevalent among the age group 30-39 years of age (24.3%). Moreover, the majority of the obese category was found in the age group 60-69 years of age (26.3%). The overall percentages of underweight, normal, overweight, and obese were observed to be (5.3%), (50.2%), (35.4%), and (9.1%). The chi-square value of this table was not significant.

Table 4: Age-wise distribution of Chiru Males in different categories of hypertension of Systolic blood pressure

Systolic blood pressure Status	Age group						Total	Freq.%	χ^2
	20-29	30-39	40-49	50-59	60-69	70-79			
Normal	17	23	14	14	5	2	75	35.9%	66.911***
	22.7%	30.7%	18.7%	18.7%	6.7%	2.7%	100.0%		
Pre-Hypertension	28	15	17	13	17	9	99	47.4%	
	28.3%	15.2%	17.2%	13.1%	17.2%	9.1%	100.0%		
Hypertension Stage-I	0	1	2	7	7	4	21	10.0%	
	0.0%	4.8%	9.5%	33.3%	33.3%	19.0%	100.0%		
Hypertension Stage-II	0	0	0	1	7	6	14	6.7%	
	0.0%	0.0%	0.0%	7.1%	50.0%	42.9%	100.0%		
Total	45	39	33	35	36	21	209	100.0	
	21.5%	18.7%	15.8%	16.7%	17.2%	10.0%	100.0%		

Table 4 shows that the individual's normal systolic blood pressure was highest (30.7%) distributed among the 30-39 age group. Pre-hypertension was found to be highest (28.3%) among the age group 20-29. Further from the table, most Hypertension Stage-I was found highest (33.3%) among 50-59 and 60-69. Hypertension Stage-II was also observed most prevalent among the 60-69 (50.0%) age group. The total frequency percent of normal, pre-hypertension, hypertension stage-I and hypertension stage- II were (35.9%), (47.4%), (10.0%), and (6.7%), respectively. The differences in the proportion of various systolic blood pressure categories and different age groups were statistically significant (χ^2=66.91, p<0.001).

Table 5: Age-wise distribution of Chiru Males in different categories of hypertension of Diastolic blood pressure

Diastolic blood pressure Status	Age Group						Total	Freq.%	χ^2
	20-29	30-29	40-49	50-59	60-69	70-79			
Normal	21	19	13	13	12	4	82	39.2%	23.380
	25.6%	23.2%	15.9%	15.9%	14.6%	4.9%	100.0%		
Pre-Hypertension	20	17	14	11	12	9	83	39.7%	
	24.1%	20.5%	16.9%	13.3%	14.5%	10.8%	100.0%		
Hypertension Stage-I	4	2	5	6	6	5	28	13.4%	
	14.3%	7.1%	17.9%	21.4%	21.4%	17.9%	100.0%		
Hypertension Stage-II	0	1	1	5	6	3	16	7.7%	
	0.0%	6.2%	6.2%	31.2%	37.5%	18.8%	100.0%		
Total	45	39	33	35	36	21	209	100.0	
	21.5%	18.7%	15.8%	16.7%	17.2%	10.0%	100.0%		

Table 5 display the prevalence of diastolic blood pressure in different age groups of Chiru Males. The

maximum frequency distribution of normal (25.6%) and pre-hypertension (24.1%) DBP was found among 20-29. The table also shows that the Hypertension Stage-I individuals were most prevalent (21.4%) among 50-59 and 60-69. The Hypertension Stage-II DBP individuals have the highest frequency distribution (37.5%) in 60-69 years. The overall frequency percent of normal, pre-hypertension, hypertension stage-I and hypertension stage- II were (39.2%), (39.7%), (13.4%), and (7.7%), respectively. The chi-square value as observed in this table was not significant.

Table 6: Correlation matrix between BMI, blood pressure, and age, and other lifestyle factors

Variables	BMI	SBP	DBP	Age	Phy. Act	Salt intake	Tobacco	Pan	Smoking	Alcohol
BMI	1	.223**	.279**	.137*	-.583**	-.061	.087	.197**	.087	.016
SBP	.223**	1	.754**	.484**	-.260**	.388**	-.011	.023	.368**	.089
DBP	.279**	.754**	1	.337**	-.335**	.217**	.111	.120	.338**	.245**
Age	.137*	.484**	.337**	1	-.164*	.213**	-.042	.016	.296**	-.078
Phy.Act	-.583**	-.260**	-.335**	-.164*	1	.009	-.102	-.173*	-.112	-.026
Salt intake	-.061	.388**	.217**	.213**	.009	1	-.278**	-.224**	-.018	-.109
Tobacco	.087	-.011	.111	-.042	-.102	-.278**	1	.459**	.408**	.462**
Pan	.197**	.023	.120	.016	-.173*	-.224*	.459**	1	.283**	.295**
Smoking	.087	.368**	.338**	.296**	-.112	-.018	.408**	.283**	1	.348**
Alcohol	.016.	0.89	.245**	-.078	-.026	-.109	.462**	.295**	.348**	1

*Correlation is significant at the**0.01 level (2-tailed); * 0.05 level (2-tailed).*[1]

Table 6 shows the Correlation between BMI, BP, age, and other lifestyle factors. BMI is significantly (P<0.05) correlated with most variables but not with salt intake, tobacco, smoking, and pan. BMI, SBP, DBP, physical activity, pan, and age are significantly inter-correlated, with a significant level (P<0.01). Physical activity (-0.583**), diastolic BP (0.279**), and systolic BP (0.223**) respectively have the strongest significant correlation with BMI. The correlation coefficient showed that the relationship of SBP with salt intake (0.388**) was stronger than diastolic BP (0.217**). Smoking has a significant correlation with SBP (0.368**) and DBP (0.338**). Besides, there was also a significant (P<0.01) positive correlation between alcohol and DBP.

Table 7: Univariate association of hypertension and lifestyle factors among Chiru Males

Variables	Hypertension		Total	%	Unadjusted odds ratio (95% CI)				
BMI	Yes	No			OR	Lower	Upper	df	Significance
Underweight	1	10	11	5.3	0.48	0.58	4.01	1	0.250
Normal	18	87	105	50.2	1				
Overweight and Obese	33	60	93	44.5	2.65	1.37	5.15	1	0.001
Total	24.8%	75.1%							
Physical activity	Yes	No			Lower	Upper			
Active	11	94	105	50.2	1				
Inactive	41	63	104	49.8	5.55	2.64	11.62	1	0.000
Salt Intake	Yes	No			Lower	Upper			
Extra salt	22	25	47	22.5	3.87	1.92	7.77	1	0.000
No extra salt	30	132	162	77.5	1				

Tobacco	Yes	No			Lower	Upper			
Tobacco user	27	57	84	40.2	1.89	1.00	3.57	1	0.048
Non-Tobacco user	25	100	125	59.8	1				
Pan	Yes	No			Lower	Upper			
Pan user	34	93	127	60.8	1.30	0.67	2.50	1	0.432
Non-Pan user	18	64	82	39.2	1				
Smoking	Yes	No			Lower	Upper			
Smoker	35	44	79	37.8	5.28	2.68	10.39	1	0.000
Non-Smoker	17	113	130	62.2	1				
Alcohol	Yes	No			Lower	Upper			
Alcoholic	21	23	44	21.1	3.94	1.94	8.01	1	0.000
Non-Alcoholic	31	134	165	78.9	1				

Note: Hypertension <No> = reference group, Hypertension = dependent category.[2]

Table 7 displays the odds ratio of BMI and other risk factors for predicting hypertension. With normal BMI as a reference group, underweight individuals were 0.48 times (Cl=0.58-4.01, p>0.05) less likely to have hypertension. In contrast, overweight and obese are 2.65 times (Cl=1.37-5.15, p<0.05) more likely to develop hypertension than normal BMI individuals. Those who were less engaged in physical activity were statistically significant (OR=5.55; Cl=2.64-11.62, p<0.05), suggesting that physically inactive participants had a higher risk of hypertension than physically active individuals. As for salt intake, individuals consuming extra salt had a higher risk of hypertension than those who were not consuming extra salt, and it was found significant (OR=3.87; Cl=1.92-7.77, p<0.05). The odd ratio also show that tobacco user were more risk of hypertension (OR=1.89; Cl=1.00-3.57, p<0.05) than the non-tobacco user. It was also found that the risk of hypertension was higher among the pan user than their counterparts non-pan users (OR=1.30; Cl=0.67-2.50, p<0.05). The association of hypertension with smokers was statistically significant (OR=5.28; Cl=2.68-10.39, p<0.05), indicating that smokers had a higher risk of hypertension than a non-smoker. Further, alcoholic subjects were also found to have statistically significant (OR=3.94; Cl=01.94-8.01, p<0.05) compared to their counterpart non-alcoholic.

Discussion

Chiru males' stature in six different age groups showed a decreasing trend from the youngest to oldest, comparable to the Tangkhul Naga Males of Manipur (Zimik, 2015). According to Martin's classification, the mean value of the Chiru Male is in the range-variation of short (i.e., 150.0cm to 159.9 cm) (Singh and Bhasin, 2004). Bodyweight shows an increasing trend with the increased chronological age of 49 years and decreases that conform to other studies (Mungreiphy *et al*., 2011; Aliyu *et al*., 2014). However, according to the National Family Health Survey, the BMI mean value of the national and state levels of Indian adult males and Manipur adult males is 21.9kg/m^2 and 22.4kg/m^2, similar to the present study.

According to the NFHS-4, 19% of adult males at the national level and 19.8% of adult males at the state level are overweight and obese. As per recent NFHS-5, the prevalence of overweight and obese among Manipur males was reported as 30.3%. However, in this present study, 44.5% are overweight and obese. The proportion of overweight and obese in this study is very high compared to (NFHS-4, 2015-2016) at national and state levels. However, compared to (NFHS-5, 2019-20), it is found moderately high at the state level. Here in this paper, the odd ratio analysis of overweight and obese individuals

showed statistically significant with hypertension in this study which is more or less comparable with other studies (Ghosh *et al*., 2016; Gopalakrishnan *et al*., 2017).

The prevalence of hypertension among Indian men from 15-49 years was 15% (NFHS-4). As the latest National Family Health Survey-5, reports 30.1% were diagnosed with hypertension in Manipur. However, in this present study, the overall prevalence of hypertension was 24.8%. The above study shows that high blood pressure is moderately high compared to the national average (NFHS-4) but relatively low than the state-level prevalence (NFHS-5) 2019-20. Many researchers in India have reported a similar prevalence of hypertension (Naresh, 2012; Das *et al*., 2014; Gopalakrishnan *et al*., 2017; Lalnuneng and Khongsdier, 2017). Blood pressure was positively correlated with both age and BMI. Blood pressure (SBP and DBP) rises with advancing age from the youngest to the oldest. In this present study, the relationship of age with blood pressure was much stronger than that of age with BMI. Mungreiphy et al. (2011), who has reported a significant relationship between blood pressure and age among Tangkhul Naga Tribal Males of Northeast India, found similar observations.

Many studies have consistently demonstrated the importance of physical activity in regulating hypertension and obesity (Diaz and Shimbo, 2013; Huai *et al*., 2013; Borjession *et al*., 2016; Ball *et al*., 2017). As observed in this present study, the odds ratio and correlation analyses show that those less engaged in physical activity have higher blood pressure and a higher risk of hypertension. A study conducted on Coastal Karnataka and rural areas in Telangana, India, showed that physically inactive individuals were more at risk of hypertension than physically active individuals (Rao *et al*., 2013; Prathyusha *et al*., 2015). In the present study, individuals consuming extra salt intake were at higher risk of developing hypertension. Other studies also confirmed this finding (Radhika *et al*., 2007; Madhukumar *et al*., 2012; Das *et al*., 2014; Prathyusha *et al*., 2015).

Tobacco is another lifestyle factor that influences hypertension as well as cardiovascular diseases. It is also well documented that tobacco consumption is a high-risk factor for cardiovascular diseases; its association with high blood pressure remains a paradox (Gamus *et al*., 2013; Jena and Purohit, 2017). The present study indicates that tobacco users have a higher risk of hypertension than non-users. A study conducted among the police personal in a district of West Bengal was recorded 1.19 times the risk more to have high blood pressure among tobacco users (Mallik *et al*., 2014), which was comparable with the present study. Adequate studies have shown a relationship between tobacco consumption and raise blood pressure (Dochi et al., 2009; Jeganathan and Chowta, 2012; Madhukumar et al., 2012). The Union government of India recently reported the key findings from Phase 1 of the National Family Health Survey conducted in 2019–20, including data regarding current tobacco use among Indian adults in 22 states and union territories. The overall prevalence of tobacco use among the Manipur men is 58.1%, whereas 40.2% is observed, which is more or less comparable with the present study.

Regular alcohol intake often leads to unhealthy lifestyles, leading to overweight and obese –one of the major risk factors for diabetes and high blood pressure (Kolcic, 2012). There are different opinions regarding whether alcohol consumption can increase blood pressure; however, frequent alcohol use is a risk for many cardiovascular diseases and hypertension (Tang *et al*., 2014; Zatu *et al*., 2016). Recent studies have shown that chronic alcohol consumption is associated with increased high blood pressure (Skliros *et al*., 2012; Husain *et al*., 2014). In this paper, alcohol has significant positive correlations with diastolic blood pressure, and the odds ratio shows that alcoholic's individuals showed a higher risk of hypertension than non-alcoholic. Again, the alcohol consumption rate among Manipur men is 37.5% (NFHS-5). However, the present study shows that 21.1% were alcoholics; this difference in the alcoholic rate indicates a moderately high alcohol consumption that may lead to severe public health problems.

Ismail *et al*. (2016) reported that hypertension was higher among smokers than the non-smoker in urban and rural populations in a coastal town of South India. A study conducted by (Bhise and Patra, 2018) in the state of Maharashtra shows that there is a significant association between smoking and hypertension. The present study observed that smoking has a significant correlation with both systolic and diastolic blood pressure. Further, through the odd ratio calculation, it is found that smokers showed a higher risk of hypertension than non-smokers.

Conclusion

The present anthropological study has concluded that the prevalence percentages of overweight, obese, and hypertension were comparatively higher than national and state levels. Further, there was a significant association between generalized obesity and high blood pressure. The study also provided strong evidence that all modifiable lifestyles and habit related risk factors, especially physical activity and smoking, significantly contribute to developing hypertension. These health problems can be managed through lifestyle modification, awareness programs, and early treatment to increase the overall quality of life.

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