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PREVALENCE AND SOCIO-ECONOMIC DETERMINANTS OF OBESITY AND HYPERTENSION AMONG TRIBAL COMMUNITY IN RURAL AND PERI-URBAN POPULATION OF BIRBHUM DISTRICT, WEST BENGAL, INDIA

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ABSTRACT BACKGROUND

Historically, tribal populations were thought to be relatively protected from "lifestyle diseases" due to traditional diet, high physical activity, less processed food. But recent evidence shows a rising trend in non-communicable diseases (NCDs) among tribal communities including hypertension and obesity likely linked to acculturation, changing lifestyles, and reduced physical activity over time. This study was done to assess the prevalence and risk factors of obesity and hypertension in a tribal area in rural and peri-urban population of Birbhum district, West Bengal. **Materials and Methods:** Data was collected on socio-demographic and behavioral factors, and anthropometric measurements were carried out. Data collection was done using a pretested questionnaire. Prevalence and 95% confidence interval were estimated for Obesity. Association between obesity with socio-demographic variables was tested using Chi-square and logistic regression was done. STATA software was used. A value of $P < 0.05$ was considered statistically

significant. **Results:** A total of 3191 adults (men 1521, women: 1670) of ≥15 years of age were covered. The overall prevalence of hypertension was 9.93% (n=317). The prevalence of hypertension increases with increase in age among both the genders. Regression analysis showed that the risk of obesity was significant. The mean age of the participants was 37.89 years (SD ± 14.61).53.02 % of the participants did not receive any formal education. The mean (±SD) SBP of men is 120.32 ± 14.07 mm Hg; in women, it is 116.65 ± 15.73 mm Hg. The prevalence of hypertension for male population was 10.78% and for female population 9.16 %. Low education level, socioeconomic and wealth status were found to be significant predictors of obesity. **Conclusion:** In the present study, hypertension, high BMI levels, and abdominal obesity have been found to be high among the studied population. The status of the population with respect to these abnormalities implicates susceptibility of the community towards various common disorders. The prevention and treatment intervention programs should be implemented taking into consideration age and gender.

KEYWORDS: hypertension, obesity, socioeconomic, tribal.

INTRODUCTION

High blood pressure is a prevalent condition in all developing countries irrespective of their present stage of health transition and both sexes are affected in large number. A widely spread misconception among the general population about cardiovascular diseases in developing countries is that these only affect richer persons. However, as the epidemic of cardiovascular disease matures, the disease burden shifts from richer and better-educated segments of a society to the poorer and less educated [Kshatriya GK, 2014]. Hypertension is the most important risk factor of non-communicable diseases in India [R. Gupta & D. Xavier, 2018]. As per the 2011 census, India's indigenous population (tribal), constitute 8.6% of the total population, amounting to 104.3 million people [Census, 2011].

Like all developing countries, large-scale developmental activities and urbanization in India have brought significant changes in the lifestyles, occupational patterns, and dietary habits of these tribal communities, once considered outreach groups. Furthermore, new "urban centers" are developing quickly near rural and tribal areas [Gopalan C, 1992; Ghurye GS, 1992; Gautam MK, 1977]. Millions of people in developing nations are facing double health burden of diseases associated with infection and nutrition along with the load of chronic non-communicable diseases (NCDs). Rapid urbanization has led to changes in daily activity, diet and lifestyle leading to NCDs like diabetes, Cardiovascular Diseases

(CVDs), neuropsychiatric disorders etc. Of the estimated 57 million global deaths in 2008, 36 million were due to NCDs [WHO, 2011]. Gopinath et al.(1994) highlighted the need for a community based programme in India to identify individuals with hypertension, bringing them into medical facilities for further evaluation and maintaining a high proportion of them in a long-term control programme [Gopinath N et al, 1994].

Prevalence of hypertension has been found to be increasing in epidemic proportions in urban, rural and tribal population of India [Gupta R et al, 1996]. Total deaths due to cardiovascular diseases were 9.1 million in developing countries and 1.5 million in India [Murray CJL& Lopez AD,.1997]. It has been predicted that by 2020, there would be 111 per cent increase in cardiovascular deaths in India. HTN is directly responsible for 57 per cent of all stroke deaths and 24 per cent of all coronary heart diseases (CHD) in India [Murray CJL& Lopez AD,.1997].The aim of the present study was to investigate the prevalence of hypertension in tribal, rural and peri-urban populations of Birbhum district, West Bengal.

METHODS

A cross-sectional study was carried out among 3191 sample population of Birbhum district, age ranging from 15 to 80 years, with 1521 men and 1670 women tribal population during February 2023 to September 2025 in 4 blocks (Suri-1, Rajnagar, Md Bazar & Sainthia) of Birbhum district, West Bengal. Parameters of height, weight, waist and hip were measured and recorded. The survey collected socio-demographic data such as education, type of house, type of fuel used and sanitation from the study areas. The data were statistically analyzed based on descriptive statistic and logistic regression using STATA (version, 12). The out-off level of significant was chosen at $p<0.05$. Univariate and multivariable regression models were used to examine the association of various factors with obesity levels.

Minimum waist circumference was measured using a nonexpendable measuring tape to calculate the waist to height ratio (WHtR). Weight was also measured using the Omeron Karada Scan Body Composition Monitor. The participants were encouraged to remove their shoes and heavy clothing before the measurements. BMI was calculated as weight in kilogram (kg) divided by height in meter squared (m2): kg/m2. Systolic and diastolic blood pressure (SBP and DBP respectively) were recorded twice using a standard mercury sphygmomanometer on the right arm of the participants. A minimum 15-minute rest before the measurement and a 5-minute interval between two measurements were ensured. The

average of the two measurements was recorded.

Inclusion & exclusion criteria:

All the individuals' ≥15 years of age and willing to participate in the study were surveyed, while those less than 15 years of age, not willing to participate and pregnant women were excluded from the study

Hypertension

According to JNC VII [Chobanian AV et al,2003]] on the basis of Systolic blood pressure (SBP) and Diastolic blood pressure (DBP), individuals can be categorized as Hypertensive when SBP ≥140 or DBP ≥90 mmHg, Normal systolic <120 mmHg and diastolic <80 mmHg and pre- hypertension systolic 120-139 mmHg and diastolic 80-89 mmHg. At least two blood pressure readings were taken and recorded and measuring blood pressure and was ensured that they hadn't engaged in vigorous physical activity, smoked, chewed tobacco, consumed beverages like tea or coffee, etc., in the preceding 30 minutes, and had not eaten lunch or snacks for at least 1 hour.

Obesity

As per Asian guidelines, Overweight is defined by BMI: 23–24.9 Kg/m2 and obesity is defined by 25 Kg/m2 and above. High BMI levels included overweight and obesity category. Abdominal obesity was defined as waist circumference of ≥90 cm for men and ≥80 cm for women [WHO/IASO/IOTF, 2000].

WHR (Waist-hip-ratio) classification based on WHO is healthy when ≤0.85 for women and ≤ 0.90 for men. Hence, we categorized WHR as healthy when WHR calculated at ≤ .85 and as risk WHR for > 0.85 for women and WHR as healthy when WHR calculated at ≤ .90 as healthy and as risk for >0.90 for men. Risk factor regrouped in binary (0 and 1) as it was treated as the dependent variable.

Waist-to-Height Ratio (WHtR) (waist circumference/height) as a superior indicator of abdominal fat (central adiposity) and associated risks (like metabolic syndrome/cardiovascular disease) because it better reflects visceral fat, often using a simple WHtR < 0.5 cutoff for "no increased risk[WHO].

Explanatory Variables

Education level of the tribal population are classified as illiterate, able to read and write,1-4

standard, 5-8 standard, 9-12 standard, college and not applicable.

Houses made from mud, thatch, or other low-quality materials are called kuccha houses, houses that use partly low-quality and partly high quality materials are called semi-pukka houses, and houses made with high quality materials throughout, including the floor, roof, and exterior walls, are called pukka houses. Again, in the study, sanitary latrine has been divided into present and in use, present and not in use and absent. Open defecation is identified as absent.

In physical activity, sedentary activity includes landlord, service, business, housewife, postman, teacher and white collar workers. Moderate activity includes labourer, other labourer, cultivator, artisan, mason, servant maid, tailor, rickshaw –puller, etc. Heavy activity includes blacksmith, stone cutter, railway gagman, wood cutter, mine worker etc.

Type of fuel used has been divided into firewood, LPG, and others. Among category others Gul/coal, dung cake were included. In the formation of wealth index, five groups have been created such as poor, poor middle, middle, upper middle and upper.

Wealth index was calculated on the basis of type of house, type of fuel materials used for cooking, sanitation and type of house used through principal components analysis (PCA) guidelines.

Statistical Analysis

The estimates were presented as mean and standard deviation for continuous variables, percentage and frequency distribution for discrete and categorical variables using descriptive statistics .Multivariable logistic regression analysis was employed to identify the leading factors to risk factors. The adjusted odds ratio (aOR) and 95% confidence interval (CI) were used to present the results. The model was adjusted for all background and other independent parameters in order to display the aOR.

RESULTS

Table-1: Baseline characteristics of study subjects stratified by gender.

Variable	Mean ±SD	Mean ±SD (male)	Mean ±SD (Female)	p-value
Age(Year)	37.89±14.61	37.45± 14.55	38.29±14.64	0.106
Hip(cm)	81.80±7.21	82.28±6.44	81.37±7.81	0.000
Height(cm)	154.72±8.10	160.25±6.49	149.68±5.82	0.000
Weight(kg)	47.68±8.89	51.33±8.38	44.35±7.99	0.000
Waist circumference (WC) (cm	73.66±8.92	74.68±8.26	72.73±9.39	0.000

WHR	.93±1.47	.91±.060	.95±2.03	0.407
BMI	19.45± 3.05	19.96±2.90	19.75±3.18	0.057

Mean values were calculated for body weight, height, hip, body mass index, waist circumference, waist –hip ratio (WHR) and waist-to height ratio(WHtR). Boys had a significantly higher mean in all measures than girls, except for BMI, height, weight, WC and hip.

Statistical high significance was observed in terms of gender in case of hip, height, weight and Waist Circumference).

Table-2: Mean systolic and diastolic blood pressure (mmHg) by age, gender and blood pressure categories.

Male					
Age Group(Year)	**n**	**BP categories**	**n(%)**	**Mean±SD**	
				Systolic BP	**Diastolic BP**
15-30	635	Normal	302(47.56)	117.54±9.51	74.43±7.98
		pre-HTN	309(48.66)		
		Hypertension	24(3.78)		
31-44	392	Normal	157(40.05)	121.31±14.92	76.92±9.80
		pre-HTN	187(47.70)		
		Hypertension	48(12.24)		
45-60	372	Normal	130(34.95)	122.97±16.73	76.96±9.79
		pre-HTN	177(47.58)		
		Hypertension	65(17.47)		
61 & above	122	Normal	46(37.70)	123.57±18.97	74.5±11.14
		pre-HTN	49(40.16)		
		Hypertension	27(22.13)		
Overall	1521				
Female					
Age Group(Year)	**n**	**BP categories**	n(%)	Mean±SD	
				Systolic BP	Diastolic BP
15-30	611	Normal	431(70.54)	111.63±10.25	70.17±8.47
		pre-HTN	172(28.15)		
		HTN	8(1.31)		
31-44	512	Normal	291(56.84)	115.26±13.32	72.58±9.54
		pre-HTN	193(37.70)		
		HTN	28(5.47)		
45-60	394	Normal	164(41.62)	122.21±18.82	75.22±10.48
		pre-HTN	156(39.59)		
		HTN	74(18.78)		
61 & above	153	Normal	51(33.33)	127.05±22.04	75.82±11.71
		pre-HTN	59(38.56)		
		HTN	43(28.10)		
Overall	1670				

SD, standard deviation; BP, blood pressure; HTN, hypertension; pre-HTN, Pre-hypertension The prevalence of hypertension increased with age group for both male and female study population. Overall prevalence of hypertension was 10.78% among men and 9.16 % among women. Again, pre-hypertension for male population was 47.47% and for female 34.73%.

Table-3: Prevalence of Waist–to–hip ratio and Waist-to-height ratio by socio-demographic characteristics among tribal population.

Background Characteristics	**Women**			**Men**		
Indicators	**WHR>0.85**	**WHtR>=0.50**	**N**	**WHR>0.90**	**WHtR>=0.50**	**N**
Age Group						
15-30	418(68.41)	183(29.95)	611	237(37.32)	103(16.22)	635
31-44	388(75.78)	262(51.17)	512	196(50.00)	125(19.69)	392
45-60	304(77.16)	196(49.75)	394	228(61.29)	134(21.10)	372
61 & above	114(74.51)	61(39.97)	153	78(63.93)	47(7.40)	122
Level of Education						
Illiterate	803(74.56)	497(46.15)	1,077	337(53.92)	184(29.44)	625
Able to read & write	7(58.33)	5(41.67)	12	5(45.45)	4(36.36)	11
1-4 Standard	80(64.52)	47(37.90)	124	103(47.25)	41(18.81)	218
5-8 Standard	170(76.23)	83(37.22)	223	134(45.27)	81(27.36)	296
9-12 Standard	135(71.43)	60(31.75)	189	141(45.93)	86(28.01)	307
College	27(64.29)	9(21.43)	42	19(31.67)	15(25.00)	60
Not applicable	2(66.67)	1(33.33)	3	0(0.00)	0(0.00)	4
Type of House						
Pucca	250(71.23)	168(47.86)	351	172(54.09)	125(39.31)	318
Semipucca	579(73.95)	334(42.66)	783	362(50.14)	196(27.15)	722
kuchha	395(73.69)	200(37.31)	536	205(42.62)	90(18.71)	481
Sanitary Latrine						
Present and in use	243(71.68)	167(49.26)	339	164(51.90)	95(30.06)	316
Present but not in use	94(55.95)	54(32.14)	168	58(37.42)	31(20.00)	155
Absent	887(76.27)	481(41.36)	1163	517(49.24)	285(27.14)	1050
Physical Activity						
Sedentary	648(69.01)	381(40.58)	939	163(52.24)	103(33.01)	312
Moderate	537(78.74)	296(43.40)	682	530(47.45)	278(24.89)	1117
Heavy	39(79.59)	25(51.02)	49	46(50.00)	30(32.61)	92
Quintile						
Poor	546(69.82)	292(37.34)	782	316(45.34)	132(18.94)	697
Poor Middle	297(71.91)	182(44.07)	413	168(47.46)	93(26.27)	354
Middle	266(78.01)	148(43.40)	341	174(52.73)	120(36.36)	330
Upper Middle	87(86.14)	54(53.47)	101	59(53.15)	48(43.24)	111
Upper	28(84.85)	26(78.79)	33	22(75.86)	18(62.07)	29

Table -4: Prevalence of Waist–to–hip ratio and Waist-to-height ratio by socio-demographic characteristics among tribal study population.

Background Characteristics	Waist Hip Ratio		Waist to height ratio	
	Low Risk(n=1228)	High Risk(male >0.90 and female >0.85[n=1963)	Low Risk[n=2078]	High[n=1113] Risk(>=0.5
Age Group				
15-30	591(48.13)	655(33.37)	958(47.24)	288(25.88)
31-44	320(26.06)	584(29.75)	517(25.49)	387(34.77)
45-60	234(19.06)	532(27.10)	436(21.50)	330(29.65)
61 & above	83(6.76)	192(9.78)	167(8.23)	108(9.70)
Level of Education				
Illiterate	562(45.77)	1140(58.07)	1021(49.13)	681(61.19)
Able to read & write	11(0.90)	12(0.61)	14(0.67)	9(0.81)
1-4 Standard	159(12.95)	183(9.32)	254(12.22)	88(7.91)
5-8 Standard	215(17.51)	304(15.49)	355(17.08)	164(14.73)
9-12 Standard	220(17.92)	276(14.06)	350(16.84)	146(13.12)
College	56(44.56)	46(2.34)	78(3.75)	24(2.16)
Not applicable	5(0.41)	2(0.10)	6(0.29)	1(0.09)
Type of House				
Pucca	247(20.11)	422(21.50)	376(18.09)	293(26.33)
Semipucca	564(45.93)	941(47.94)	975(46.92)	530(47.62)
kuchha	417(33.96)	600(30.57)	727(34.99)	290(26.06)
Sanitary Latrine				
Present and in use	248(20.20)	407(20.84)	393(18.91)	262(23.54)
Present but not in use	171(13.93)	152(7.78)	238(11.45)	85(7.64)
Absent	809(65.88)	1404(71.89)	1447(69.63)	766(68.82)
Quintile				
Poor	617(50.24)	862(43.91)	1055(50.77)	424(38.10)
Poor Middle	302(24.59)	465(23.69)	492(23.68)	275(24.71)
Middle	231(18.81)	440(22.41)	403(19.39)	268(24.08)
Upper Middle	66(5.37)	146(7.44)	110(5.29)	102(9.16)
Upper	12(0.98)	50(2.55)	18(0.87)	44(3.95)

Table-4 presents the socioeconomic characteristics of the sample population for both WHR and WHtR. In WHR the absent of toilet facility or open defecation was 71.89 % for high risk and 65.88 % for low risk participants. The percentage of illiterate was 45.77 for low risk and 58.07 for high risk participants. Again high risk factor was higher who belong to upper middle and upper wealth index among study population.

Now for participants with WHtR , Obesity was comparatively higher for high risk upper middle and upper wealth index participants and the percentage of illiterate participants were higher for high risk participants compared to low risk participants. Most of the tribal

population not used toilet facility in study area.

Table-5: The Comparison of Waist-to-hip ratio and Waist-to-height ratio by Socio-demographic Characteristics among tribal study population.

Background Characteristics	Waist Hip Ratio		Waist to height ratio	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Age Group				
15-30(Reference)				
31-44	1.57(1.31 1.88)	0.000	2.42(2.00 2.92)	0.000
45-60	2.11(1.74 2.57)	0.000	2.56(2.10 3.12)	0.000
61 & above	2.03(1.52 2.71)	0.000	2.08(1.58 2.76)	0.000
Level of Education				
Illiterate(Reference)				
Able to read & write	.58(.248 1.36)	0.213	1.025(.436 2.41)	0.955
1-4 Standard	.72(.567 .93)	0.010	.59(.46 .78)	0.000
5-8 Standard	.83(.67 1.02)	0.083	.75(.61 .93)	0.009
9-12 Standard	.77(.623 .954)	0.017	.70(.56 .87)	0.002
College	.48(.319 .733)	0.001	.52(.32 .83)	0.007
Not applicable	.22(.041 1.21)	0.083	.28(.033 2.38)	0.246
Type of House				
Pucca(Reference)				
Semipucca	.98(.811 1.19)	0.887	.69(.59 .84)	0.000
kuchha	.84(.68 1.04)	0.106	.51(.42 .63)	0.000
Sanitary Latrine				
Present and in use(Reference)				
Present but not in use	.52(.39 .68)	0.000	.53(.39 .711)	0.000
Absent	1.06(.88 1.28)	0.508	.79(.66 .96)	0.015
Type of Fuel used				
Firewood(Reference)				
LPG	2.50(1.59 3.94)	0.000	3.24(2.20 4.76)	0.000
Others	1.60(1.28 1.99)	0.000	1.41(1.14 1.73)	0.001
Quintile				
Poor(Reference)				
Poor Middle	1.10(.91 1.32)	0.311	1.39(1.16 1.69)	0.000
Middle	1.42(1.16 1.73)	0.000	1.69(1.4 2.06)	0.000
Upper Middle	1.71(1.24 2.35)	0.001	2.39(1.78 3.23)	0.000
Upper	3.14(1.63 6.04)	0.001	6.30(3.57 11.12)	0.000

Table -5 the adjusted odds ratios and 95% confidence intervals from logistic regression analyses with waist-hip-ratio(WHR) and Waist-to-height ratio(WHtR) group as the dependent variables in sample population has been shown. Adjusted effects of WHR were in the table, kutcha type of house (odd ratio: 0.84; 95% confidence level: 0.99 1.81),semi pucca house (odd ratio: 0.98 ; 95% confidence level: 0.811 1.19), absence of sanitation facility (odd ratio: 1.06; 95% confidence level: (.88 1.28) , LPG gas as cooking fuel (odd ratio: 2.50

, 95% confidence level: 1.59 3.94), middle wealth index (odd ratio: 1.42 ; 95% confidence level: 1.16 1.73) and upper middle wealth index (odd ratio: 1.71 ; 95% confidence level: 1.24 2.35) and upper wealth index (odd ratio : 3.14 ; 95% confidence level: 1.63 6.04). Hence p- values were not significant in all of the cases type of house, absent sanitary facility and poor middle wealth index.

Again, adjusted effects on WHtR were in the above table, 1 - 4 standard (odd ratio: .59; 95% confidence level: 0.46 0.78), 5-8 standard (odd ratio: 0.75, 95% confidence level: 0.61 0.93), 9 – 12 standard (odd ratio: 0.70; 95% confidence level: 0.56 0.87), semipucca house (odd ratio: 0.69, 95% confidence level: 0.59 0.84), kucca house (odd ratio: 0.51; 95% confidence level: 0.42 0.63), LPG fuel type (odd ratio: 3.24; 95% confidence level: 2.20 4.76) , poor middle wealth index (odd ratio: 1.39; 95% confidence level: 1.16 1.69), middle wealth index (odd ratio: 1.69; 95% confidence level: 1.4 2.06) , upper middle wealth index (odd ratio: 2.39; 95% confidence level: 1.78 3.23) and upper wealth index (odd ratio: 6.30; 95% confidence level: 3.57 11.12). In most of the cases p-values are highly significant.

DISCUSSION

The present paper aims to examine the prevalence of obesity and hypertension among the Santhal population. High prevalence of overweight and obesity along with hypertension were observed in both males and females of this community. Several recent studies, in this regard, have reported on the prevalence of NCD risk factors in tribal populations residing in different parts of India [Kandpal et al. 2016; Kshatriya et al. 2016; Sajeev and Soman 2018; Tripathi 2020].

Obesity and overweight both are the result of energy imbalance in the body, where the energy intake from food exceeds the energy expenditure through physical activity. Maintaining a balance between energy intake and expenditure is essential to prevent the deposition of excess fat mass in the body. It is recommended to perform certain physical activities to expend excess amount of energy. A recent study on the pattern of physical activity in India revealed that a significant proportion of the Indian population (57%) is physically inactive or only mildly active, and females are less physically active than males [podder V et al, 2020].

The present study reported a large proportion of population in the prehypertensive group (47.47% men & 34.73 % women). Kusuma et al observed 50% and 57% prevalence of pre-hypertension among tribal men and women of Orissa [Kusuma YS & Das PK., 2008].

The findings revealed a high prevalence of hypertension among the studied Indian tribes, with a high prevalence of obesity among women and men respectively. The prevalence of obesity was similar among men and women. The increased prevalence of obesity along with high and hypertension indicated that women are at a higher risk of CVD-related vulnerabilities. This further implies a strong gender inequality with respect to food security [Patel RC, 2012].]

An overall SES variable was created to assess the complex relationships between SES, obesity, and hypertension. However, several limitations should be acknowledged. First, measurement errors were inevitable due to self-reported socioeconomic information and hypertension based on a single blood pressure measurement.

Limitations of the study: Sample size was small and included participants from 4 blocks of Birbhum district in rural and peri-urban population. Therefore, the study findings cannot be generalized to entire community of Birbhum district, West Bengal. Chances of selection bias might be there. Genetics, behaviour, Yoga, meditation, psycho-social factors, underlying medical condition and other potential factors which affect BMI and BP of the study participants were not studied.

Urbanization and its triggered lifestyle changes, marginalization in the broad socioeconomic context, and cultural shift are crucially associated and suggestive factors of a non-communicable disease burden and nutritional extremes among Indian tribes. Finally the study reports for the first time, a comprehensive picture of adverse health conditions among Indian tribal populations that are largely disadvantaged groups of India. Therefore, a systematic and comprehensive health policy along with timely intervention programs is strongly warranted.

Given that obesity is a preventable condition, the role of public health policymakers becomes pivotal. It is essential to address the stigma associated with obesity, as it can hinder appropriate healthcare-seeking and resource utilization, early identification of complications, and the management of morbidity. Obesity has profound effect son both the physical and psychosocial aspects of an individual's quality of life, with morbidly obese individuals experiencing more significant impacts. In fact, the risk of developing chronic medical conditions is nearly doubled in morbidly obese individuals compared to those who are overweight. Blood pressure increases in parallel with body weight [Jones DW et al, 1994].

Among obese, the incidence of high blood pressure is 2–3 times higher than in non-obese individuals [Okosun IS et al, 1999]

CONCLUSION

Due to Urbanization, lifestyle changes and cultural shift among the Indian tribes, the non-communicable diseases are increasing at an alarming rate when compared to general population. As the prevalence of hypertension among tribal population is almost similar to general population, Tribal health must be given importance in the general NCD surveillance. The estimation of prevalence of hypertension among tribal population is necessary because it is essential for rational planning of health services. It will also be helpful for the public health policy makers for allocating sufficient resources or its prevention and management. This study will be helpful for the policy makers for changing the health needs among the tribal people in India

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Ethical Issues

All the participants in the study were informed about the purpose of the study and full free and voluntary written consent was taken before their inclusion. Each participant was free to withdraw from the study at any point in time and was ensured confidentiality of the responses.

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We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

Conflict of interest

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REFERENCES

1. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ.(2003) The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood

Pressure: the JNC 7 report. *JAMA*:; 289(19):2560–72.

2. Gautam MK. In search of an identity: A case of the Sandals of northern India. Leiden, The Netherlands; 1977
3. Ghurye GS. Anatomy of a Rural urban Community. Bombay: Popular Prakashan; 1963.
4. Gopinath N, Chadha SL, Shekawat S, Tandon R. (1994). A 3-year follow-up of hypertension in Delhi. Bull World Health Organ ; 72:715-20
5. Gopalan C. Nutrition in developmental transition in South-East Asia. Regional Health Paper, SEARO, No. 21. World Health Organization, Regional Office for South-East Asia. New Delhi, 1992
6. Gupta R, al-Odat NA, Gupta VP. (1996) Hypertension epidemiology in India: meta-analysis of 50 year prevalence rates and blood pressure trends. *J Hum Hypertens*; 10:465-72.
7. Jones DW, Kim JS, Andrew ME, et al.(1994). Body mass index and blood pressure in Korean men and women: the Korean National Blood Pressure Survey. *J Hypertens*; 12(12): 1433–1437, doi: 10.1097/00004872-199412000-00018, indexed in
8. Pubmed: 7706705.
9. Kandpal, V , Sachdeva, M. P, Saraswathy, K. N. (2016). An assessment study of CVD related risk factors in a tribal population of India. *BMC Public Health* 16 (1), 434. https://doi.org/10.1186/s12889-016-3106-x.
10. Kshatriya, G. K., Acharya, S. K., Gonzalez-Bulnes, A. (2016). Triple Burden of Obesity, Undernutrition, and Cardiovascular Disease Risk among Indian Tribes. *PLoS One* 11 (1), e0147934. https://doi.org/10.1371/journal.pone.0147934.
11. Kshatriya GK. (2014).Changing perspective of tribal health in context of increasing life style diseases in India. *J Environ Social Sci*. ;1:1–7
12. Kusuma YS, Das PK. Hypertension in Orissa, India: a cross-sectional study among some tribal, rural and urban populations. Public health 2008; 122:1120-23.
13. Murray CJL, Lopez AD. (1997). Mortality by cause for eight regions of the world: Global Burden of Disease Study. *Lancet*; 349:1269-76.
14. Okosun IS, Prewitt TE, Cooper RS.(1999).Abdominal obesity in the United States: prevalence and attributable risk of hypertension. *J Hum Hypertens*.; 13(7): 425–430, doi: 10.1038/sj.jhh.1000862, indexed in Pubmed: 10449204.
15. Podder, V, Nagarathna, R, Anand, A. et al.(2020). Physical activity patterns in India stratified by zones, age, region, BMI and implications for COVID-19: a nationwide study. *Ann Neurosci*. ; 27:193-203

16. Patel RC.(2012). Food sovereignty: power, gender, and the right to food. PLoS Med. https://doi.org/10.1371/journal.pmed.1001223
17. R. Gupta, D. Xavier (2018). Hypertension: the most important non communicable disease risk factor in India. *Indian Heart J*, 70 (4), pp. 565-572
18. Registrar General of India, Census of India (2011) http://www.censusindia.gov.in
19. Sajeev, P, Soman, B. (2018). Prevalence of noncommunicable disease risk factors among the Kani tribe in Thiruvananthapuram district, Kerala. *Indian Heart J 70 (5*), 598–603. https://doi.org/10.1016/j.ihj.2018.01.022.
20. WHO/IASO/IOTF. The Asia –Pacific perspective: redefining obesity and its treatment. Melbourne: Health Communication Austrailia; 2000.