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Gender Wise Prevalence of Obesity and Nutritional Status among Hypertensive Periurban Population in Birbhum district, West Bengal, India

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ABSTRACT

Objective: The objective intends to assess the gender wise obesity and nutritional status among hypertensive population in Birbhum district, West Bengal

Materials and Methods: The present study aimed to explore the sex differential in the association of anthropometric measures including body mass index, waist circumference, waist-hip ratio and hypertension among adult population in periurban Birbhum district, West Bengal. In study the participants who were hypertensives after diagnosed by skilled professional for last 10 years at least once. The sample contains 363 males and 524 females aged 18 years and above. Univariable and multivariable logistic regression was conducted to explore the association between gender wise hypertension and its associated factors. The research was carried out in two blocks named Bolpur Sriniketan and Illambazar blocks of Birbhum. Study area and participants were selected through simple random sampling (SRS) technique. Anthropometric measures were taken and various risk factors such as Body Mass Index (BMI), Waist Hip Ratio (WHR) and Blood Pressure (Systolic and Diastolic) were calculated.

Results: Hypertension rate was highest for the age group 50 years and above after taking medicines [70 % male & 55.34 % female]. High-risk waist hip ratio was observed among 11.85 % males and 9.41 % females. Medicines had taken only 71.93% population in study area who were previously hypertensive. Multivariable logistics regression (MLR) revealed that socioeconomic variables had an impact on hypertension and obesity. Both adjusted and unadjusted logistic regression analysis has been done on gender wise hypertensive population. WHR was statistically highly significant (P=0.000) between male and female population.

Conclusion: The current study showed the association of waist hip ratio (WHR) and Body Mass Index with independent gender wise hypertensive study population of Birbhum district, West Bengal

Key Words: Body Mass Index, Waist Hip Ratio, Hypertension

Introduction

Hypertension or high blood pressure (hereafter BP) as one of the leading risk factors of global disease burden has contributed to a considerable number of premature deaths worldwide. The global burden of diseases and associated risk factors has changed significantly over the past two decades with a clear shift from communicable to non-communicable diseases [**Lim S, Vos T et al, 2012**]. As per WHO report, alcohol consumption was the third largest risk factor in the developed countries and tobacco use was being the second major cause of death worldwide [WHO 2005].

Most notably, high blood pressure (BP) has been ranked as the number one contributing factor to the global burden of non-communicable disease, as it is an important and highly prevalent risk factor for both cerebrovascular and cardiovascular disease.[**National High Blood Pressure Education Program, 2004**]. Globally, various behavioural, socioeconomic, demographic and genetic factors have been linked with the occurrence of hypertension [**WHO 2013**].

One of the major treatable public health problems on the rise is hypertension, and it is linked to both overweight and obesity [**Jayawardena, R et al 2012**]. . Hypertension is a one of the risk factors for obesity-related CVDs [**Fuchs FD et al 2005**]. Hypertension is a major risk factor for cardiovascular disease and is directly responsible for 57% of all the stroke deaths and 24% of all the coronary heart disease deaths in India [**Gupta R. 2004**]. Transition that involved availability of fast foods, soft drinks, sedentary lifestyle, physical inactivity, and increase use of technology related gadgets, youngsters were found to be less active and eat more, resulting with increase of body mass index (BMI) and fat [**Severinsen MT et al. 2009**]. In this context, the present study intends to find out socioeconomic determinants of hypertensive and Waist –Hip Ratio risk factors among adult Bengali males and females in West Bengal.

Materials and Methods:

A cross-sectional study was conducted among adult males and females, aged 18 to 80 years during June 2022 to December 2022. The study considers those people who have been residing there at least a long decade. Data were collected from both tribal and non-tribal people; tribal people belonged to the Santal community and non-tribals were from Hindu and Muslim religions. Age of the participants was confirmed on the basis of birth certificate. For those who did not have a birth certificate, the school certificate, Voter ID card or Aadhaar card was carefully considered as a secondary source.

Explanatory variables

The explanatory variables for the present study were taken into consideration after an extensive literature review. The main explanatory variables were overweight/obesity condition, and high-risk waist-hip ratio and pre hypertensive and hypertensive of adult population. BMI was calculated by dividing the weight (in kilograms) by the square of height (in m). Using this, the patients were categorized as underweight (<18.5 kg/m2), normal or lean BMI (18.5–24.99 kg/m2), overweight & Obese (≥25 kg/m2) based on the revised consensus guidelines for WHO.

WHR classification based on WHO is healthy when ≤0.85 for women and ≤ 0.90 for men. Hence, we categorized WHR as healthy WHR when calculated at ≤ .85 and as risk WHR for > 0.86 for women and WHR as healthy when WHR calculated at ≤ .90 as heathy and as risk for >0.90 for men.

Hypertension is defined as systolic BP level of ≥140 mmHg and/or diastolic BP level of ≥90 mmHg or being previously diagnosed as hypertensive by any health professional (JNC7). The area falling between 120–139 mmHg systolic BP and 80–89 mmHg diastolic BP is defined as "prehypertension"[**Chobanian A. V. et al 2003**] In datasheet, individuals whose systolic blood pressure <120 mmHg or diastolic blood pressure <80mmHg were deleted. Hence only prehypertensive and hypertensive cases have been considered.

The prevalence of hypertension (in percentage) among women and men was presented by selected background characteristics. In order to identify individual-level key demographic, socio-economic, and lifestyle factors of hypertension we used multivariate binary logistic regression models The sociodemographic variables under study were age, gender, religion, occupation, literacy and highest educational level , type of fuel used , sanitation facility availed and quintile.

Houses made from mud, thatch, or other low-quality materials are called mud 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, toilet facility has been divided into open toilet, pit latrine and sanitary latrine. Level of education has been divided into no education, primary, middle school, secondary, higher secondary graduation and above. , 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 household assets through principal components analysis (PCA) guidelines.

Odds ratio (OR) was estimated with 95% confidence interval (CI). Statistical significance was determined at a p-value ≤ 0.05. Data entry was performed in the MS excel spreadsheet. Data analysis was carried out using STATA software.

Results

Gender wise distribution of Waist Hip Ratio, BMI and Hypertension

Within the age group 18 to 80 anthropometric indicators such as WHR and BMI were significantly ($p<0.01$) different between male and female, but Systolic and Diastolic Blood Pressure were not statistically significant. The study population had mean weight (kg) 54.47 ± 11.48, height (cm) 155.33 ± 9.45, Waist Hip Ratio 0.97 ± 0.08 , body mass index (BMI) 22.49 ± 3.98, systolic blood pressure (SBP) = 139.34 ± 15.37 and Diastolic blood pressure (DBP)= 80.57± 9.21. BMI was statistically significant between male and female population in study area (P =0.00), SBP and DBP both were not statistically significant between the gender wise study group of population. WHR was also statistically highly significant (P=0.000) between male and female population.

Table-1: Difference of mean (SD) among Gender wise Study Population

Indicators	All Subjects X ± SD	Male X ± SD	Female X ± SD	P -values
Age	54.12 ± 11.61	56.94 ± 10.92	52.16 ± 10.92	0.000
Weight (kg)	54.47 ± 11.48	57.49± 11.36	52.37±11.10	0.000
Height (m)	1.55 ± 9.45	1.62 ± 7.99	1.50 ± 6.46	0.000
WC (cm)	86.55 ± 11.53	86.92 ± 10.83	86.29 ± 11.99	0.425
HC (cm)	88.83 ± 8.5	87.72 ± 7.40	89.59 ± 9.12	0.001
WHR	0.97 ± 0.08	0.98 ± 0.74	0.96 ± 0.81	0.000

BMI	22.49 ± 3.98	21.57 ± 3.37	23.13 ± 4.24	0.000
SBP	139.34 ± 15.37	138.92 ± 14.27	139.63±16.09	0.494
DBP	80.57± 9.21	80.43± 9.34	80.67±9.13	0.711

Key: SD = Standard Deviation, X = mean value, P = probability, WC = Waist Circumference, HC= Hip circumference, WHR = Waist Hip Ratio, BMI= Body Mass Index, SBP=Systolic Blood Pressure, DBP= Diastolic Blood Pressure

Table-2: Correlation between Indices of Adiposity and Cardiovascular Variables for all Participants

Indicators		WC	WHR	BMI
SBP	R	0.970	0.000	0.377
	p- value	0.030	0.549	0.004
DBP	R	0.910	0.001	0.31
	p- value	0.001	0.007	0.00

Table -3: **Main Characteristics of the Study Population**

Characteristics	Overall(887)	Male(n= 363)		Female(N=524)		p-value
	Number	Number	%	Number	%	
Age Group						
18 to 40 Years	107	24	6.61	83	15.84	0.00
41 to 50 Years	234	83	22.87	151	28.82	
51 to 60 Years	282	121	33.33	161	30.73	
61 years & above	264	135	37.19	129	24.62	
Literacy						
Illiterate	245	62	17.08	183	34.92	0.00
Literate	642	301	82.92	341	65.08	
Education Level						
No Education	245	62	17.08	183	34.92	0.00
Primary	110	26	7.16	84	16.03	
Middle School	188	63	17.36	125	23.85	
Secondary	150	70	19.28	80	15.27	
Higher Secondary	75	47	12.95	28	5.34	
Graduate & Above	119	95	26.17	24	4.58	
Body Mass Index						
Underweight	233	55	15.15	178	33.97	0.00
Normal	513	244	67.22	269	51.34	
Overweight & Obese	141	64	17.63	77	14.69	
Waist-Hip Ratio						
Low Risk	791	320	88.15	471	83.66	0.42
High Risk	96	43	11.85	53	9.41	
Hypertension						
Prehypertensive	487	208	57.30	279	53.24	0.23
Hypertensive	400	155	42.70	245	46.76	
Smoking						
Yes	265	172	47.38	93	17.75	0.00
No	622	191	52.62	431	82.25	
Alcohol drinking						

Yes	30	28	7.71	2	0.38	0.00
No	857	335	92.29	522	99.62	
Medicine Taken						
Yes	638	266	73.28	372	70.99	0.46
No	249	97	26.72	152	29.01	

Table-3 presents the characteristics of 363 males and 524 females of adult population in study area. Nearly half of the older participants belonged to the age of more than 50 years (70 % male & 55.34 % female). In study population, all the participants were hypertensive after measuring blood pressure though some of them have taken medicines after consultation with doctors. But more than 50 % are award regarding the importance of hypertension and obesity. Females are more reluctant than males to take medicines in time. About 17.08 % of males and 34.92% of females were illiterate or not completed primary education. Moreover, 17.63 % and 14.6 9% of males and females were found overweight/obesity. Female population (33.97) was found underweight more than male (15.15) population. High-risk waist hip ratio was observed among 11.85 % males and 9.41 % females. After taking medicine 42.70 % of males and 46.76 % of females are hypertensive. About 47.38 % of males and 17.75 % of females are active smokers in sample study. Jobless males and females had a higher chance of suffering from hypertension than those currently working. Sedentary activity among study population increased with age and suffered from hypertension.

Table-4: **Socioeconomic Characteristics of Hypertensive Study Population**

Characteristics	**Overall(887)**	**Male(n= 363)**		**Female(N=524)**		**p-value**
	Number	**Number**	**%**	**Number**	**%**	
Type of Fuel						
biogas	1	1	0.28	0	0.00	0.239
coal/gul	37	15	4.13	22	4.20	
dung cakes	64	22	6.06	42	8.02	
electricity	25	8	2.20	17	3.24	
kerosene	4	2	0.55	2	0.38	
lpg/natural gas	562	242	66.67	320	61.07	
straw/shrubs /grass	58	18	4.96	40	7.63	
wood	136	55	15.15	81	15.46	
Toilet Used						
no toilet	140	54	14.88	86	16.41	0.055
pit latrine	30	7	1.93	23	4.39	
sanitary latrine	717	302	83.20	415	79.20	
Type of House						
Floor Type						
mud	184	69	19.01	115	21.95	0.297
pukka	679	284	78.24	395	75.38	
Semi pukka	24	10	2.75	14	2.67	
Wall Type						
mud	209	81	22.31	128	24.43	0.356
pukka	611	257	70.80	354	67.56	
Semi pukka	67	25	6.89	42	8.02	
Roof Type						
mud	113	43	11.85	70	13.36	0.126
pukka	553	239	65.84	314	59.92	
Semi pukka	221	81	22.31	140	26.72	
Mobile Phone Use						
Yes	851	354	97.52	497	94.85	0.047
No	36	9	2.48	27	5.15	

Motorbike Use						
Yes	436	204	56.20	232	44.27	0.00
No	451	159	43.80	292	55.73	
Quintile						
Poor	41	13	3.58	28	5.34	0.013
Poor Middle	75	32	8.82	43	8.21	
Middle	96	33	9.09	63	12.02	
Upper Middle	248	83	22.87	165	31.49	
Upper	427	202	55.65	225	42.94	

Table-4 presents the socioeconomic characteristics of the sample population. The consumption of LPG gas as cooking fuel was more than 60 %, but the indigenous products e.g. straw/shrubs/grass and dung cakes was around 10 % while the use of wood as a fuel was nearly 15 % among study population. The use of toilet was 80.83 % while the use of no toilet was 15.78% only which indicates that the study population belong to better socioeconomic status. Around 75 % populations belong to upper middle and upper in quintile in study population. The table shows that mobile phone (around 95%) and motorbike (around 50%) users are more hypertensive due to sedentary activity (less physical activity) who are belonging to the upper class in the society.

Table-4: Crude and multivariable odds ratios (95% CI) for hypertensive Study population

Category of explanatory variables	Univariable			Multivariable		
	Crude Odd Ratio	CI (95 %)	p - Value	Adjusted Odd Ratio	CI (95 %)	p - Value
Male(Reference)						
Female	1.178	0.899-1.543	0.233	1.342	.9943 1.811	0.054
Hindu(Reference)						
Muslim	1.548	1.122- 2.134	0.008	1.520	1.098 2.104	0.012
Christian	1.338	.0833-21.476	0.837	1.517	.0930 24.744	0.77
Scheduled Caste(Reference)						
Scheduled Tribe	0.302	.0347 2.624	0.278	0.309	.0354 2.694	0.288
OBC	1.542	.9608 2.473	0.073	1.554	.9615 2.511	0.072
Other	1.331	.9795 1.807	0.068	1.377	1.004 1.887	0.047
Illiterate(Reference)						
Literate	0.824	.6135 1.1070	0.199	0.836	.6175 1.131	0.246
No Education (Reference)						
Primary	1.098	.7001 1.7220	0.684	1.113	.7054 1.755	0.646
Middle School	1.059	.7239 1.5485	0.768	1.086	.7383 1.597	0.675
Secondary	0.649	.4289 .9818	0.041	0.651	.4265 .9946	0.047
Higher Secondary	0.498	.2886 .8602	0.012	0.498	.2871 .8629	0.013
Graduate & above	0.767	.4932 1.1935	0.240	0.771	.4923 1.205	0.254
Quintile						
Poor(Reference)						
Poor Middle	0.879	.4104 1.883	0.740	0.872	.4063 1.871	0.725
Middle	0.993	.4777 2.063	0.985	0.981	.4691 2.050	0.959
Upper Middle	0.797	.4114 1.544	0.502	0.785	.4017 1.534	0.479
Upper	0.701	.3688 1.331	0.277	0.688	.3581 1.320	0.261

Crude odd ratio[1] was calculated by logistic regression analysis

Adjusted odd ratio[2] was calculated by multiple logistic regression analysis after adjusting for bmi, Waist-hip ratio, drinking alcohol and smoking

In table-4 unadjusted and mutually adjusted odds ratios and 95% confidence intervals from logistic regression analyses with hypertension as the dependent variable in sample population Adjusted for the confounding effects of bmi, WHR, drinking alcohol and smoking, women were hypertensive (odds ratio 1.34; 95% confidence interval: .9943, 1.811). Literate participants were also hypertensive (odds ratio: 0.836; 95% confidence interval: .6175, 1.131), the participants with graduation and above (odds ratio: 0.771; 95% confidence interval: .4923, 1.205), upper socioeconomic group (odd ratio: 0.688; 95% confidence interval: .3581 1.320)

Discussion

The present study was designed to determine the prevalence of overweight, obesity, hypertension at the study population of Birbhum district, West Bengal according to age group, sex. In India 12 percent of women age 15-49 have hypertension. The prevalence of hypertension among men age 15-49 is almost equal to women (NFHS-5) .Again the 2019-20 NFHS measured the waist circumference and hip circumference of men and women age 15-49 years. This information was used to calculate Waist Hip Ratio. About three-fourths (75%) of women and 57 % men have a waist to hip ratio (WHR) that put them at a substantially increased risk of metabolic complications. The proportion of adults with such increased risk of WHR increases with age from 63 % for women age 15-19 to 81 for women age 40 49 and from 37 % for men age 15-19 to 66 % for men age 40-49. In our analysis women are more hypertensive than men at current stage after detection of blood pressure. Again WHR is higher among men than women in sample population for hypertensive patients.

In West Bengal among adults age 15-49, 2 percent of women and 13 percent of men drink alcohol. In study population 7.71 % men and 0.38 % drink alcohol.

The majority of study participants with hypertension were award that they had hypertension but only around 70 % population take medicine to control hypertension. The findings about these risk factors for hypertension are not surprising and are in agreement with several other studies where age, obesity, and sedentary lifestyle were significant factors for hypertension.

Our study has several limitations. First, we conducted our survey only on small sample population. Secondly, we do not consider the dietary questionnaire and are therefore unable to comprehensively characterize the diet style for this community and relate the diet style with presence of hypertension.

Despite the several limitations, our study has an important strength. We conducted this study in a periurban location, an area that clearly is at high risk for non-communicable diseases due to changes in diet and physical activity.

Conclusion

Obesity is one of the greatest public health challenges in modern times, and is inextricably linked to adverse cardiovascular risk Weight loss is the cornerstone of treatment for obesity and its metabolic consequences. Physical inactivity is a state of concern as it leads to major health problems like obesity, hypertension and various metabolic disorders. Exercise is recommended as a therapeutic lifestyle change as it leads to various health benefits. Too much use of motorbike and mobile phone is positively associated with obesity and hypertension. Many of the behaviours likely to reduce blood pressure also have independent beneficial effects on other cardiovascular risk factors to general health and survival. This is particularly the case with weight control, exercise, dietary patterns characterized by a low intake of saturated fat and a high intake of fruit, vegetables and fish and moderation of heavy alcohol consumption. Smoking has a dominant effect in increasing cardiovascular risk in hypertensives.

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Conflict of interest:

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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