

PREVALENCE OF HYPERTENSION, PREHYPERTENSION AND ITS RELATIONSHIP WITH DEMOGRAPHIC, ANTHROPOMETRIC INDICATORS, AND BEHAVIORAL RISK FACTORS: A POPULATION-BASED CROSS-SECTIONAL STUDY IN THE DISTRICT MURSHIDABAD, WEST BENGAL, INDIA

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Abstract—Hypertension is the primary risk factor for cardiovascular diseases, a serious threat to a healthy life and an enormous burden on the public health care system. Several studies from different parts of India indicate an increase in the prevalence of HTN. So far as the eastern region, particularly Murshidabad, is concerned, only a few studies are available. To assess the prevalence and the associated risk factors of hypertension in the district Murshidabad. A multi-stage cross-sectional study was carried out in adults aged 18-67 years (N=2000) between 2013 to 2018, and the results were analyzed using statistical tools. The overall prevalence was found to be 33.5%, the isolated Systolic and diastolic HTN was respectively 9.3% and 5.6%. Only 28.96% of the participants were aware of the condition and was taking medicine, and 43.81% of those on medication had their BP adequately under control. Age, sex, marital status, level of education, occupation, and income were found to be risk factors of hypertension and a significant association was noted. The harmful use of alcohol and smoking, as well as BMI and abdominal obesity, were also found to be significant risk factors. **Conclusion:** The prevalence of HTN was high, but the control and awareness were low. In addition to improvements in awareness, diagnosis, and treatment, homemakers need special attention because of high prevalence in this group.

INTRODUCTION

Hypertension (HTN) or elevated blood pressure is one of the leading causes of premature deaths and disability worldwide. It has been estimated that the death toll and disability-adjusted life years attributed to HTN are 10.2 million and 208 million, respectively (Gupta *et al.*, 2019). While the prevalence declined in many high-income countries a substantial rise could be observed in low and middle-income countries particularly in South Asia (Zhou *et al.*, 2017). In India, the prevalence is increasing. The rates of hypertension awareness treatment and control are also increasing but are lower than the proposed targets by WHO (Gupta *et*

al., 2018). Apart from the National Family Health Survey (NFHS) and District Level Household and Facility Survey (DLHS), the data on trends of blood pressure distribution, hypertension prevalence, and awareness in India is scarce, fragmentary, and heterogeneous. Particularly the data from the eastern region is poor. So far as Murshidabad is concerned, only a few studies are available. To assess the actual situation in this area, in the context of the increasing trend of HTN in India, a multistage cross-sectional study was carried out between 2013 to 2018. This survey enabled us to estimate the prevalence of HTN, its awareness, and associated risk factors in this population over this time period.

MATERIALS AND METHOD

Study area

The study was conducted in the randomly selected blocks of Murshidabad, a district of the state of West Bengal, India. The district has a total area of 5316.11 sq. km. and a population of 71,03,807 (Census, 2011). The male-female representations of this population were 36,27,564 (51.06%) and 34,76,243 (48.93%) respectively. Only 19.72% of the population lived in urban areas while, the rest were villagers (80.28%).

Study Design and Sampling Methodology

Cross-sectional research design was employed in the population of the selected area in multiple stages using probability sampling (simple random), in adults aged 18-67. In the first stage, eight blocks were selected, out of the 26, in the district using the rand function of MS Excel. In the second stage, campsites were randomly selected from each of the blocks. In the third stage, willing participants were randomly interviewed using a structured interview schedule. Out of 2311 individuals interviewed, a total of 2000 eligible participants were selected and included in the study.

Study Participants

Healthy individuals aged between 18-67 years, resident of the selected area, and willing to participate were considered for the study. Individuals with medical or psychological problem, pregnancy, inability or unwillingness to participate were excluded.

Tools of the study

Structured interview schedule for obtaining data related to sociodemographic characteristics and behavioral risk factors. Body weight scales, both digital (OMRON) and mechanical (KRUPS), portable stature meter, and anthropometric tapes for anthropometric measurements. And for the blood pressure measurement, both digital (OMRON) and Aneroid (Dr. Morepen) BP monitors were used with periodic checking and validation of accuracy.

Blood pressure and Anthropometric measurements

The blood pressure was measured following the guideline provided by JNC-7 (2004) (VII, 2004). For anthropometry, Anthropometry procedures manual of National Health and Nutrition Survey (NHANES) by CDC was used ("National Health

and Nutrition Examination Survey (NHANES). Anthropometry Procedures Manual," 2013). BMI and WHR were calculated following the WHO Expert Consultation (2008) ("Waist Circumference and Waist-Hip Ratio," 2008).

Definitions Used

The classification of the Joint national committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) was followed for Hypertension, Prehypertension, and Isolated systolic/diastolic hypertension. And WHO Expert Consultation (2008) was used for BMI and WHR.

Statistical Analysis

The database was initially developed by entering data in Microsoft Excel and then analyzed using the IBM SPSS Statistics Version 24. χ^2 and logistic regression were used for risk factor analysis.

Ethical Clearance

All the procedures have been approved by the Institutional Ethics committee IPGME&R Research Oversight Committee, Institute of Post Graduate Medical Education and Research, Kolkata.

RESULTS

A total of 2000 participants [1377 male (68.85%) and 623 females (31.15%)], with overall median age of 30 (± 13.15) years and sex specific median age of 28 (± 13.69) years for male and 33 (± 11.8) years for females, were included in this study. On marital status, 1161 (58.05%) of the participants were married and 835 (41.75%) were unmarried. On the parameter of BMI, 25.75% were overweight and nearly 4% were obese. Abdominal obesity (WHR) was even higher approaching nearly ~ 50%. Please See Table 1 for detailed on background characteristics. The overall mean SBP of the studied population was 129.57 (± 16.56) and DBP was 81.21 (± 9.84) with relatively higher mean SBP (except age group 48-57) and DBP in males compared to females in all age groups. With the advance in age through the age class, the mean SBP and DBP steadily increased in both sexes, with the highest mean BP in the age class 48-57. One notable exception was the SBP of men, it kept increasing beyond the age group 48-57 and the age class 58-67 had the highest SBP (Table 2 & 3).

A very high prevalence of HTN was noted, with an overall prevalence of 33.5%, threatening the lives

Table 1. Background characteristics of study subjects.

	Variables	N (2000)	Proportions %
Age Group	18-27	900	45
	28-37	401	20.05
	38-47	319	15.95
	48-57	269	13.45
	58-67	111	5.55
Sex	Male	1377	68.85
	Female	623	31.15
Marital Status	Married	1161	58.05
	Unmarried	835	41.75
	Others	4	0.2
Education	Illiterate	70	3.5
	Primary	74	3.7
	Secondary	155	7.75
	Higher Secondary	594	29.7
	Graduate and above	1107	55.35
Occupation	Daily labor	127	6.35
	farmer	67	3.35
	service	509	25.45
	students	671	33.55
	Homemakers	431	21.55
	Self-employed	195	9.75
Income group	<5000	91	4.55
	5000-10000	577	28.85
	10000-20000	772	38.6
	20000-50000	506	25.3
	>50000	54	2.7
BMI	Overweight	515	25.75
	Obese	81	4.05
Abdominal Obesity	Obese Male	639	31.95
	Obese Female	323	16.15
	Total Obese	962	48.1

of one-third of the studied population. Of this total hypertensive, about 20.21% was under Stage-1 and 6.15% was under Stage-2 (excluding known hypertensives). On a gender basis the HTN was more prevalent in males compared to females (see Table 4). Across the age class, as the age increases so did the prevalence, with the highest overall percentage (69.40%) at the age group (58-67). However, the trend was slightly different in the two sexes; in men hypertension was most prevalent in the eldest age group (58-67) while in females it was the age group 48-57 that had the maximum percentage (see Table 5, 6).

For isolated systolic and diastolic HTN, the overall prevalence was respectively 9.3% and 5.6% (excluding known hypertensives). The age and sex-specific trend of the Isolated Systolic HTN was a bit intricate. However, the trend of Isolated Diastolic HTN was- steady increase up to age class (38-47) and then a decline in the prevalence (see Table 7 for detailed).

Only 28.96% of the studied population was aware of the condition and was taking medicine, and 43.81% of those taking medicine had their blood pressure adequately under control. Female participates had marginally better awareness and control compared to the male participants (see Table 8).

Risk factor assessment

On sociodemographic parameters, a significant ($P < 0.05$) association of HTN with sex, age, marital status, profession, education, and income was revealed by the χ^2 analysis. The analysis also shows a positive association between the two most common behavioral risk factors, such as tobacco and the harmful use of alcohol, with hypertension. The association of these risk factors with hypertension

Table 2. Overall Systolic Blood Pressure mmHg, mean (\pm SD)

Age Group(years)	Male			Female			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
18-27	676	128.38	\pm 13.421	224	116.93	\pm 11.944	900	125.53	\pm 13.97
28-37	236	129.94	\pm 13.125	165	122.1	\pm 15.614	401	126.71	\pm 14.7
38-47	191	133.38	\pm 15.09	128	130.78	\pm 17.833	319	132.34	\pm 16.269
48-57	187	136.49	\pm 17.945	82	139.91	\pm 19.444	269	137.54	\pm 18.446
58-67	87	147.14	\pm 19.704	24	138.71	\pm 22.288	111	145.32	\pm 20.483
Total	1377	131.63	\pm 15.541	623	125.01	\pm 17.807	2000	129.57	\pm 16.562
Test of Significance	F = 38.737 df = 4 P < 0.001			F = 43.071 df = 4 P < 0.001			F = 67.024 df = 4 P < 0.001		

Table 3. Overall Diastolic Blood Pressure mmHg, mean (\pm SD)

Age Group (years)	Male			Female			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
18-27	676	80.23	\pm 9.109	224	75.83	\pm 9.179	900	79.14	\pm 9.318
28-37	236	82.26	\pm 9.112	165	80.19	\pm 9.853	401	81.41	\pm 9.467
38-47	191	83.94	\pm 8.92	128	83.47	\pm 11.157	319	83.75	\pm 9.864
48-57	187	84.22	\pm 9.878	82	84.18	\pm 9.206	269	84.21	\pm 9.661
58-67	87	83.41	\pm 12.02	24	80.04	\pm 9.998	111	82.68	\pm 11.653
Total	1377	81.84	\pm 9.535	623	79.82	\pm 10.343	2000	81.21	\pm 9.836
Test of Significance		F = 11.050 df = 4 P<0.001			F = 17.742 df = 4 P<0.001			F =23.216 df = 4 P<0.001	

Table 4. Prevalence of hypertension in study subjects (excluding Known hypertensive)

	n	Normal	% Normal	Pre HTN	% Pre HTN	Stage-1	%Stage-1	Stage2	%Stage2	Known HTNs	*Total HTN*%	Hypertensive
Total	1806	401	22.20	929	51.44	365	20.21	111	6.15	194	670	33.50
male	1237	195	15.76	672	54.32	292	23.61	78	6.31	140	510	37.04
female	569	206	36.20	257	45.16	73	12.83	33	5.80	54	160	25.68*

Including Known hypertensive

Table 5. Prevalence of Hypertension across Age Group

		Age groups					
		18-27	28-37	38-47	48-57	58-67	Total
Total	Normal (%)	77.70	74.10	58.60	42.00	30.60	66.50
	Hypertensive (%)	22.30	25.90	41.40	58.00	69.40	33.50
Male	Normal (%)	73.40	69.90	57.10	40.10	25.30	63.00
	Hypertensive (%)	26.60	30.10	42.90	59.90	74.70	37.00
Female	Normal (%)	90.60	80.00	60.90	46.30	50.00	74.30
	Hypertensive (%)	9.40	20.00	39.10	53.70	50.00	25.70

Table 6. Overall prevalence of hypertension in study subjects across age group (excluding Known hypertensives)

		Age groups						
		n	18-27	28-37	38-47	48-57	58-67	Total
Total	Normal	1806	26.6%	22.6%	18.3%	11.6%	7.6%	22.2%
	Pre HTN		52.5%	53.7%	48.7%	48.1%	43.9%	51.4%
	HTN Stage-1		17.4%	17.7%	26.9%	25.9%	27.3%	20.2%
	HTN Stage-2		3.4%	5.9%	6.1%	14.3%	21.2%	6.2%
Male	Normal	1237	18.9%	12.6%	13.5%	12.7%	4.2%	15.8%
	Pre HTN		56.0%	59.1%	50.6%	46.8%	41.7%	54.3%
	HTN Stage-1		21.4%	22.2%	29.4%	27.8%	29.2%	23.6%
	HTN Stage-2		3.8%	6.1%	6.5%	12.7%	25.0%	6.3%
Female	Normal	569	50.0%	37.1%	25.7%	9.5%	16.7%	36.2%
	Pre HTN		42.3%	45.9%	45.9%	50.8%	50.0%	45.2%
	HTN Stage-1		5.5%	11.3%	22.9%	22.2%	22.2%	12.8%
	HTN Stage-2		2.3%	5.7%	5.5%	17.5%	11.1%	5.8%

Table 7. Prevalence of Isolated Hypertension * (%) within age Group.

		Age Group					Total
		18-27	28-37	38-47	48-57	58-67	
Total	Isolated Systolic HTN	8.3%	6.2%	11.5%	13.2%	21.2%	9.3%
	Isolated Diastolic HTN	5.0%	6.7%	8.6%	3.2%	1.5%	5.6%
Male	Isolated Systolic HTN	10.6%	9.1%	14.1%	13.5%	22.9%	11.6%
	Isolated Diastolic HTN	5.4%	7.0%	8.2%	2.4%	2.1%	5.7%
Female	Isolated Systolic HTN	1.4%	1.9%	7.3%	12.7%	16.7%	4.4%
	Isolated Diastolic HTN	3.6%	6.3%	9.2%	4.8%	0.0%	5.4%

*Excluding Known Hypertensive

Table 8. Awareness treatment and control of Hypertension

	Category	n (Individuals with HTN)	No. of individuals aware & taking medicine	% Aware of HTN and Taking medicine	BP Under control	% Having BP under control
Overall	Male	510	140	27.45	61	43.57
	Female	160	54	33.75	24	44.44
	Total	670	194	28.96	85	43.81

and prehypertension has been shown in Table 9.

Logistic regression analysis showed higher odds of being hypertensive was associated with males (OR:1.702), eldest age group (OR:7.876), Married people, (OR:2.109), homemakers (OR:3.956), illiterate subjects (OR:1.792), and subjects in the income group 10000-20000 (OR:1.157). Based on behavioral risk factors both smokers (OR:1.969) and Alcohol users had higher odds of being hypertensive. Occasional users of Alcohol had even higher odds (OR:3.624) than regular users (OR:3.014). On the anthropometric parameter, both types of obesity, based on BMI (OR:2.527) and WHR (abdominal) (OR:2.025), had higher odds of hypertension.

Expectedly the active peoples were at lower risk than the inactive people (OR:0.941). However, the association was not significant ($P>0.05$). The association was also not significant ($P>0.05$) in the case of income group as well (see Table 10 for details).

DISCUSSION

The high prevalence of both hypertension (33.5%) and prehypertension (51.4%) observed in this study is the reflection of the trend of the increasing prevalence of hypertension in India (Gupta *et al.*, 2018, 2019). Some of the earliest studies in India found only 4% (Dubey, 1954) and 3% (Wasir *et al.*,

1984) prevalence, but as time passed, prevalence kept increasing and the same trend of the increase could be observed in our study.

The observed prevalence of HTN (33.50% overall, 37.04% in males and 25.68% in females) in this current study was found to be higher than the prevalence reported by the World Health Organization (Noncommunicable diseases country profile 2018) (Organization W.H., 2018) 24% overall, 24% male and 23% female, and by some of the earlier studies (Gupta *et al.*, 1996; Bhansali *et al.*, 2015).

The reported prevalence in this area by NFHS-5 (Ministry of Health and Family Welfare, 2019) was 10.9% for stage-I and 3.2% for stage-II in men and 10.0% and 5.3% respectively for stage-I and stage-II in women. These were much lower than the prevalence found in our study, according to which the prevalence of stage-1 and stage-II was 23.6% and 6.3% for men, and for women, the prevalence was 12.8% and 5.8% respectively. This massive difference in prevalence could be due to the inclusion of younger study subjects in NFHS-5 (15 years and above). However, the trend in increase in the prevalence of HTN is clear even from the NFHS studies if we compare NFHS-4 vs NFHS-5.

In parity with many other studies (Everett and Zajacova, 2015; Gillis and Sullivan, 2016) males were at higher risk compared to females (37.04% vs 25.68%). The biological differences (Ramezankhani

et al., 2019; Singh *et al.*, 2017), the behavioral risk factor differences (Mukamal *et al.*, 2006; Pescatello, 2005; Taylor *et al.*, 2009), such as smoking, alcohol use, or difference in physical activity or stress level between the two sexes, could be some of the

underlying factors behind this observation.

The prevalence of HTN is age-related (Buford, 2016; Franklin, 1999), and our study found both systolic BP and hypertension to be positively associated with age. As age advanced, so did the

Table 9. Prehypertension and Hypertension according to sociodemographic characteristics and behavioral risk factors.

Variables		N	Normal (Expected)	Prehypertensive	Hypertensive	Test of significance
Sex	Male	1377	195(276.1)	672(639.6)	510(461.3)	P<0.001 df=2 $\chi^2= 98.228$
	Female	623	206(124.9)	257(289.4)	160(208.7)	
Age Group	18-27	900	235(180.5)	464(418.0)	201(301.5)	P<0.001 df=8 $\chi^2= 217.106$
	28-37	401	88(80.4)	209(186.3)	104(134.3)	
	38-47	319	51(64.0)	136(148.2)	132(106.9)	
	48-57	269	22(53.9)	91(125.0)	156(90.1)	
	58-67	111	5(22.3)	29(51.6)	77(37.2)	
Marital Status	Married	1161	218(240)	546(580)	397(339)	P<0.001 df=4 $\chi^2= 57.678$
	Unmarried	835	193(167.4)	440(387)	202(279)	
	Other	4	0(0.8)	3(1.9)	1(1.3)	
Profession	Daily labor	127	32(26.4)	53(63.3)	42(37.1)	P<0.001 df=10 $\chi^2= 92.766$
	Farmer	67	7(13.9)	36(33.5)	24(19.6)	
	Service	509	66(105.6)	262(254.5)	181(148.9)	
	Students	671	163(139.2)	368(335.5)	140(196.3)	
	Homemakers	431	124(89.4)	194(215.5)	113(113)	
	Self-employed	195	23(40.5)	87(97.5)	85(57.0)	
Education	Illiterate	70	13(14.0)	27(32.5)	30(23.5)	P<0.001 df=10 $\chi^2= 32.480$
	Primary	74	19(14.8)	24(34.4)	31(24.8)	
	10th	155	35(31.1)	63(72.0)	57(51.9)	
	10+2	594	143(118.7)	283(275.0)	166(198.3)	
	Graduate	847	148(170.0)	391(393.9)	309(284.1)	
	Postgraduate and above	260	43(52.3)	141(121.2)	77(8.4)	
Income Group	<5000	91	23(18.9)	38(42.3)	30(30.5)	P=0.012 df=8 $\chi^2= 19.570$
	5000-10000	577	130(115.7)	268(268.0)	179(193.3)	
	10000-20000	772	158(154.8)	334(358.6)	280(258.6)	
	20000-50000	506	76(101.5)	265(235.0)	165(169.5)	
	>50000	54	14(10.8)	24(25.1)	16(18.1)	
Smoking	Smoker	352	43(70.6)	145(163.5)	164(117.9)	P<0.001 df=2 $\chi^2= 37.470$
	Non-smoker	1648	358(330)	784(765.5)	506(552.1)	
Alcohol Use	Users	74	5(14.8)	23(34.4)	46(24.8)	P<0.001 df=2 $\chi^2= 29.524$
	Nonusers	1926	396(386.2)	906(894.6)	624(645.2)	
Physical activity	Active	599	108(120.1)	296(178.2)	195(200.7)	P=0.166 df=2 $\chi^2= 3.588$
	Inactive	1401	293(280.9)	633(650.8)	475(469.3)	

Table 10. Logistic regression analysis for the association of hypertension and sociodemographic, anthropometric, and behavioral risk factors.

	<i>Variables</i>	<i>P value</i>	Odds ratio	Class interval (95%)	
				Lower	Upper
<i>Sex</i>	<i>Male</i>	<0.001	1.702	1.379	2.101
	<i>Female</i>		1.0 (reference)		
<i>Age Group</i>	<i>18-27</i>		1.0 (reference)		
	<i>28-37</i>	0.157	1.218	0.927	1.6
	<i>38-47</i>	<0.001	2.455	1.869	3.224
	<i>48-57</i>	<0.001	4.801	3.598	6.406
	<i>58-67</i>	<0.001	7.876	5.108	12.143
<i>Marital Status</i>	<i>Unmarried</i>		1.0 (reference)		
	<i>Married</i>	<0.001	2.109	1.731	2.568
	<i>Other</i>	0.970	1.045	0.108	10.098
<i>Profession</i>	<i>Daily labor</i>	0.003	1.873	1.245	2.819
	<i>farmer</i>	<0.001	2.697	1.609	4.521
	<i>service</i>	<0.001	2.584	2.006	3.330
	<i>students</i>		1.0 (reference)		
	<i>Homemakers</i>	<0.001	3.956	2.830	5.532
	<i>Self-employed</i>	0.002	1.543	1.173	2.031
<i>Education</i>	<i>Illiterate</i>	0.035	1.792	1.041	3.085
	<i>Primary</i>	0.045	1.723	1.011	2.935
	<i>10th</i>	0.125	1.390	0.912	2.118
	<i>10+2</i>	0.663	0.931	0.676	1.283
	<i>Graduate</i>	0.040	1.370	1.014	1.850
	<i>Postgraduate and above</i>		1.0 (reference)		
<i>Income Group</i>	<i><5000</i>		1.0 (reference)		
	<i>5000-10000</i>	0.710	0.914	0.571	1.465
	<i>10000-20000</i>	0.535	1.157	0.73	1.835
	<i>20000-50000</i>	0.946	0.984	0.612	1.582
	<i>>50000</i>	0.676	0.856	0.413	1.776
<i>Smoking</i>	<i>Smoker</i>	<0.001	1.969	1.558	2.488
	<i>Non-smoker</i>		1.0 (reference)		
<i>Alcohol Use</i>	<i>Users</i>	0.011	3.014	1.281	7.088
	<i>Occasional Users</i>	<0.001	3.624	2.044	6.424
	<i>Nonusers</i>		1.0 (reference)		
<i>Physical activity</i>	<i>Active</i>	0.558	0.941	0.768	1.153
	<i>Inactive</i>		1.0 (reference)		
<i>BMI</i>	<i>Normal</i>		1.0 (reference)		
	<i>Underweight</i>	<0.001	0.434	0.292	0.645
	<i>Overweight</i>	<0.001	2.009	1.624	2.485
	<i>Obese</i>	<0.001	2.527	1.606	3.975
<i>Abdominal Obesity</i>	<i>Normal</i>		1.0 (reference)		
	<i>Obese</i>	<0.001	2.025	1.676	2.445

prevalence of hypertension.

On marital parameter, married subjects and the subjects in the other group (divorced, widow, widower) were found to have higher odds ratios and were more susceptible to HTN compared to the unmarried group. The higher age of married people could be one of the contributing factors. Many other studies confirmed the higher susceptibility of the 'other group' (Manfredini *et al.*, 2017; Ramezankhani *et al.*, 2019) as was found in our study, however, the nonsignificant association observed in this study could be due to a low number of participants.

A positive association between income and HTN was indicated by the χ^2 analysis ($\chi^2=19.570$, $df=8$, P value=0.012), However, such association was absent in the logistic regression analysis, Singh *et al.*, (2017) also reported similar findings (Singh *et al.*, 2017). Taking the postgraduate and above as a reference, the illiterate group had the highest odds followed by subjects with primary education. This negative relation between education and HTN was supported by several studies (Di Chiara *et al.*, 2017; Singh *et al.*, 2017). Homemakers had the highest odds of gating hypertension (based on profession). Financial dependence, confinement, or psychological pressure could be the underlying cause of this high prevalence among the homemakers (Chaitra and Shivakumar, n.d.).

Both alcohol and smoking are two well-known risk factors of hypertension (Mukamal *et al.*, 2006; Organization W.H., 2005) and this study found them to be positively associated.

Physical activity is one of the key lifestyle modifications for the prevention and control of HTN. And expectedly the active lifestyle was negatively associated with HTN compared to inactive lifestyle (OR: 0.941)(Pescatello, 2005; Pescatello *et al.*, 2004). The reason behind the difference being insignificant ($P>0.05$), however, may be due to the fact that many of the hypertensive subjects have started exercise under medical advice after being diagnosed with HTN or other risk factors; as speculated by Singh *et al.* (2017).

Both BMI and WHR are considered some of the foremost anthropometric risk factors for hypertension (Dalton *et al.*, 2003; Xiao *et al.*, 2016). And consequently, the overweight study subjects were found to have twice the odds compared to the normal study subjects (OR:2.009). The odds were even higher with the obese people with an Odds Ratio of 2.527. Abdominal obesity with an excess of adipose tissue is associated with an altered

hemodynamic profile which induce harmful changes in the cardiovascular system. So, the expectedly abdominally obese subjects had twice the odds(OR:2.025) (Messerli, 1982; Zhang and Reisin, 2000).

The percentages of participants aware and taking medicine, i.e. undergoing treatment (28.96), and the percentage of control (43.81) were much lower than a recent study conducted by Saju *et al.* (2020) but were much higher than the nationally representative values (Prenissl *et al.*, 2019). However, the present study is in parity with some studies (Singh *et al.*, 2017). The slightly higher treatment and control in the female were also reported by a number of studies (Everett and Zajacova, 2015; Gupta *et al.*, 2020).

CONCLUSION

The prevalence of both prehypertension and hypertension in Murshidabad was found to be high, but the treatment and control were low. Specifically, men, uneducated, and elderly peoples are at higher risk. Programs are needed to improve diagnosis and treatment especially among men, illiterate, and elderly peoples. Homemakers also need special attention.

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Conflicting Interest - None

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