PATTERNS OF HYPERTENSION AMONGST RURAL POPULATION AGED 13 YEARS AND ABOVE IN KANPUR, UTTAR PRADESH

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ABSTRACT

BACKGROUND

Hypertension is more prevalent in low and middle-income countries. There are also more people affected, because more people live in those countries than in high-income countries. The increasing prevalence of hypertension is attributed to population growth, ageing and behavioural risk factors such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress. It is the most common CVD disorder, which poses a major public health challenge to a population undergoing socioeconomic evolution.

The objectives of the study were to determine the prevalence of hypertension and associated risk factors among rural population of Kanpur (UP).

MATERIALS AND METHODS

A randomised controlled trial study was conducted from July 2017 to June 2018 among 1410 subjects aged ≥ 13 years who were residents of area under Rural Health Training Centre (RHTC), Mandhana block of Kanpur district and they were selected through multistage random sampling method.

RESULTS

Hypertension prevalence was 21.27% and pre-hypertension was found in 15.4% among study population. Prevalence of hypertension was significantly associated with high age group, while maximum number of subjects who were pre-hypertensive aged between (20 - 30) years. It was slightly more among the male subjects than in females. Smoking was significantly associated with hypertension. It was more prevalent among mild and sedentary lifestyle, unhealthy eating habits and association was significant with BMI ≥ 25 .

CONCLUSION

In the study, every fifth study individual is hypertensive, where smoking (tobacco in any form) and obesity was found as the commonest risk factor for it. Pre-hypertension among adolescent and young adults may be resulting from lack of exercise, eating habits, stress, increasing urbanisation and changing lifestyle.

KEY WORDS

Pre-Hypertension, Risk Factor, BMI.

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BACKGROUND

Hypertension is more prevalent in low- and middle-income countries. There are also more people affected, because more people live in those countries than in high-income countries. Further, because of weak health systems people with hypertension who are undiagnosed, untreated and uncontrolled is also higher in low- and middle-income

countries compared to high-income countries.^[1] The increasing prevalence of hypertension is attributed to population growth, ageing and behavioural risk factors such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress.

The adverse health consequences of hypertension are compounded, because many affected people also have other health risk factors that increase the odds of heart attack, stroke and kidney failure. These risk factors include tobacco use, obesity, high cholesterol and diabetes mellitus. Hypertension is a chronic condition of concern because of its role in the causation of Coronary Heart Disease (CHD), stroke and other vascular complications. It is the most common CVD disorder, which poses a major public health challenge to a population undergoing socioeconomic evolution.^[2]

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It is one of the major risk factors for CVD mortality, accounting for 20 - 50% of all deaths. Every fourth individual in India aged above 18 years has raised blood pressure and the prevalence has increased by 10% from 2010 to 2014.^[3]

MATERIALS AND METHODS

Study Design

A randomised controlled trial study has been carried out in rural area of district Kanpur Nagar over the period of July 2017 to June 2018.

Sample Size and Sampling Procedure

Sample size was calculated using formula for determination of sample size for estimating proportions.

Sample Size

Sample size for current study was calculated using the formula-

$$\text{Sample size (N)} \geq \frac{Z^2 \cdot 1-\alpha/2 \times p \times q}{(d)^2}$$

N=Sample size; $Z_{1-\alpha/2}$ = 1.96 [Value of Z for 95% probability]

p=Prevalence; q=1-P; d=Allowable error (10% of Prevalence)

NFHS 4 data depicts the mean prevalence of blood pressure to be 22.4% (for both men and women, total of all the three categories#).^[4]

Minimum sample size ≥ 1380 using above formula.

Study Population an Overview

Total families surveyed= 348 with mean family size of 5.2. Enumerated total family members= 1810. Identified eligible respondents 1810 - 360 (19.88% population was 13 years) =1450. After various exclusion criteria, 1410 respondents were interviewed and included in the study.

Inclusion and Exclusion Criteria

All family members ≥ 13 years were included in the study with those who were willing to participate except critically ill and pregnant women and subjects who were found absent during two consecutive visits and/or not willing to participate in the study.

Sampling Technique

Multistage random sampling technique was used to select representative sample population of rural Kanpur.

Sampling Technique

Multistage random sampling technique was used to select representative sample among population of rural Kanpur.

First Stage

There are 24 villages and 4 subcentres belonging to area of jurisdiction of RHTC Shivrajpur. Two of the sub-centres were selected randomly.

Second Stage

At the second stage, 1 village was selected randomly from each of the two sub-centres. House to house survey was

carried out in each of the selected villages, starting from the first house on the left. All members of the families, who voluntarily agreed to participate, in the age of thirteen years and above will be interviewed and examined to obtain the required information.

Study Tools and Equipment

Data was collected using predesigned and pretested proforma, Mercury Sphygmomanometer blood pressure measuring apparatus, calibrated electronic weighing machine and stature meter respectively.

Study Technique

Oral informed consent was taken from all the participants. Personal interview and clinical examination were done. Blood pressure (BP) recorded by mercury sphygmomanometer (Auscultatory method). Two measurements were taken at 10 minutes time interval, after persons were seated for at least 30 mins. Blood pressure measurements were made on the subject's left arm using a cuff of appropriate size at the level of the heart. Weight and height were measured by using electronic weighing machine and stature meter respectively.

Study Variables

Age, gender, educational status, occupational status, family type, socio-economic status (according to modified BG Prasad's classification), and risk factors for hypertension (Family history of hypertension, type of diet, amount of salt intake, history of alcohol intake, history of smoking, history of tobacco chewing, history of physical activity and BMI).

Criteria for Diagnosis of Various Variables of the Study

1. Hypertension diagnosed as per JNC-VII criteria.
2. Classification of hypertension for paediatric and adolescents. [Adopted from Lurbe E, Alvarez J, Redon J. Diagnosis and treatment of hypertension; hypertension reports 2010;12;480-6].
3. Body Mass Index (BMI) according to standard criteria of World Health Organization.

Ethical Consideration

Ethical clearance was taken from the Ethical Committee of Rama Medical College and Research Centre, Mandhana, Kanpur (UP). Before the interview was commenced, the purpose of the study was clearly explained to the respondents. The willingness to participate by the subjects in the study was confirmed by taking their oral informed consent. Due confidentiality was maintained by using coding system for analysis.

Statistical Analysis

Data was analysed using the SPSS version 21.0. The prevalence rates are given as percentages. Qualitative data was analysed using Pearson's Chi-square test. Continuous data were analysed using suitable statistical techniques. The p-values less than 0.05 was considered statistically significant. The data thus analysed were presented in tabular form and interpretations were made to draw important conclusions.

RESULTS

Present study shows that overall prevalence of hypertension was 21.27%. Among total (N= 1410) respondents, 300 were found hypertensive. Further (4.7%) were within the group, adolescents and teens aged between (13 - 19 years), rest 95.3% respondents were adults and elderly aged (> 20 years). Overall prevalence of pre-hypertension was 14.5% [Table 1].

Results showing that maximum 29.7% subjects aged > 60 years and minimum 4.7% subjects aged between 13 - 20 years were hypertensive. The association between age and HTN status of subjects was found statistically highly significant ($\chi^2= 17.116$; d.f.= 10; $p= 0.000$).

Out of a total 300 hypertensives, 153 were males and 147 were females. Hypertension among males was slightly more than females, but pre-hypertension was much higher among males in our study. The association between different hypertensive stages and gender is statistically significant ($\chi^2= 14.352$, df= 2; $p= 0.001$).

Maximum 27.7% belonged to lower class and minimum 10.0% subjects belonged to upper socio-economic status. This association between socio-economic status and

hypertension was found statistically significant ($\chi^2= 59.241$, df= 8; $p= 0.000$).

Most of the hypertensive subjects, 80.1% were having family H/O hypertension and 19.9% were not having any family H/O hypertension. The association between family H/O hypertension and hypertensive status of respondents was found to be statistically significant ($\chi^2= 14.352$, df= 2; $p= 0.001$).

Results shows that mean SBP and DBP increases with increasing age. Mean SBP of subjects aged between 13 - 20 years was 110.43 ± 9.02 , DBP was 72.16 ± 6.40 and in age group > 60 years, SBP was 133.92 ± 23.50 and DBP was 77.46 ± 8.59 . Mean SBP amongst female was 121.58 ± 17.42 and DBP was 77.49 ± 8.96 , which was higher than males SBP 121.00 ± 16.64 and DBP 77.44 ± 8.28 . Social class-II (upper middle) subjects were with highest mean SBP 126.90 ± 15.55 , DBP 80.72 ± 15.60 and minimum among class-IV (Lower middle) SBP 120.24 ± 16.20 and DBP 76.12 ± 8.12 . Respondents with family H/O of HTN were having more SBP 132.68 ± 20.78 , DBP 82.60 ± 8.13 than without family H/O HTN SBP 121.20 ± 17.18 and DBP 82.60 ± 8.13 [Table 3]

Group	Normotensive	Pre-HTN	HTN (Stage-I/II)	Total
Adolescent and Teens (13 - 19) Years	1711 (19.0%)	28 (13.5%)	14 (4.7%)	213 (15.4%)
Adults and Elderly (> 20) Years	731 (81.0%)	180 (86.5%)	286 (95.3%)	1197 (84.6%)
Total	902 (100%)	208 (100%)	300 (100%)	1410 (100%)

Table 1. Prevalence of HTN among Adolescent/ Teens and Adults/ Elderly

Figure 1

Variables	Hypertensive Status			Total	Chi-Square (χ2)	df	P value
	Normal	Pre-HTN	HTN				
Age Group							
13-20	171 (19.0%)	28 (13.5%)	14 (4.7%)	213 (15.1%)	179.116	10	0.000
20-30	264 (29.3%)	64 (30.8%)	25 (8.3%)	353 (25%)			
30-40	182 (20.2%)	43 (20.7%)	56 (18.7%)	281 (19.9%)			
40-50	130 (14.4%)	28 (12.5%)	56 (12.5%)	212 (15.0%)			
50-60	60 (6.7%)	21 (10.1%)	60 (20.0%)	141 (10.0%)			
>60	95 (10.5%)	26 (12.7%)	89 (29.7%)	210 (14.9%)			
Gender							
Male	484 (53.7%)	139 (66.8%)	153 (51.0%)	776 (55.0%)	14.352	2	0.001
Female	418 (46.3%)	69 (33.2%)	147 (41.0%)	634 (45.0%)			
SES							
Class-I	94 (10.4%)	21 (10.1%)	39 (13.0%)	154 (10.5%)	59.241	8	0.000
Class-II	92 (9.1%)	56 (26.9%)	45 (15.0%)	183 (13.0%)			
Class-III	250 (27.7%)	42 (20.2%)	89 (29.7%)	381 (27.0%)			
Class-IV	197 (21.7%)	37 (17.8%)	65 (21.7%)	299 (21.2%)			
Class-V	279 (30.9%)	62 (25.0%)	52 (20.9%)	393 (27.7%)			
Family H/O HTN							

Yes	130 (11.4%)	26 (12.5%)	152 (50.7%)	281 (19.9%)	225.753	2	0.000
No	799 (88.6%)	182 (87.5%)	148 (49.3%)	1129 (80.1%)			
N=	902	208	300	1410			
Table 2. Demographic Determinants/ Non-Modifiable Risk Factors							
Variables	N	(%)	Mean (SBP)	Range	Mean (DBP)	Range	
Age Group (Years)							
13-20	213	15.1	110.43±9.02	100 - 134	72.16 ± 6.40	60 - 84	
20-30	353	25.0	116.18 ± 7.96	108 -140	75.24 ± 6.32	70 - 92	
30-40	281	19.9	120.64 ± 13.68	110-180	76.64 ± 7.47	70 -110	
40-50	212	15.0	123.61 ± 20.09	100 -188	77.97 ± 8.89	60 -112	
50-60	141	10.0	130.14 ± 18.24	110 - 180	82.00 ± 7.89	70 - 110	
> 60	210	14.9	133.92 ± 23.50	110 -186	84.12 ± 9.84	70 - 110	
Total	1410	100	121.26 ± 17.18	100 - 188	77.46 ± 8.59	60 -112	
Gender							
Male	776	55.0	121.00 ± 16.65	100 - 180	77.44 ± 8.28	60 - 110	
Female	634	45.0	121.58 ± 17.82	100 - 188	77.49 ± 8.96	60 - 112	
Total	1410	100	121.26 ± 17.18	100 -188	77.46 ± 8.59	60 - 112	
Socio-Economic Status							
Class-I	154	10.9	124.83 ± 24.74	100 - 186	76.61 ± 12.21	68 -110	
Class-II	183	13.0	126.90 ± 15.55	110 - 180	80.72 ± 8.11	70 - 110	
Class-III	381	27.2	121.04 ± 15.60	110 - 188	76.92 ± 6.93	70 - 112	
Class-IV	299	21.2	120.24 ± 16.21	100 - 184	76.12 ± 8.22	60 - 94	
Class-V	393	27.9	118.22 ± 15.62	100 - 180	77.04 ± 8.44	60 -110	
Total	1410	100	121.26 ± 17.18	100 - -188	77.46 ± 8.59	60 - 112	
Family H/O HTN							
Yes	281	19.9	132.68 ± 20.74	110 - 188	82.60 ± 8.13	70 - 112	
No	1129	80.1	118.42 ± 14.88	100 - 186	76.18 ± 8.22	60 - 110	
Total	1410	100	121.20 ± 17.18	100 - 188	77.46 ± 8.59	60 - 112	
Table 3. Mean SBP/DBP with Lifestyle Related/ Modifiable Risk Factors							

Table 3. Mean SBP/DBP with Lifestyle Related/ Modifiable Risk Factors

Risk Factors		B	SE	Wald	df	Sig.	OR	95% CI for OR	
								Lower	Upper
a. Variable(s) entered on Step 1: Diet, Smoking Chewing Tobacco, Mild/Moderate and Heavy (Alcohol Intake), Excess Salt Consumption, Physical Activity, BMI range	Diet	.522	.132	15.535	1	.000	1.686	1.300	2.185
	Smoking Chewing Tobacco	-.501	.139	12.942	1	.000	.606	.461	.796
	Mild/ Moderate (Alcohol Intake)	-.147	.189	.606	1	.436	.863	.597	1.250
	Heavy (Alcohol Intake)	.371	.157	5.609	1	.018	1.449	1.066	1.970
	Excess Salt Consumption	-.667	.151	19.441	1	.000	.513	.381	.690
	Physical Activity	.560	.167	11.242	1	.001	1.750	1.262	2.428
	BMI Range	1.229	.152	65.215	1	.000	3.419	2.537	4.608
	Constant	-.758	.232	10.717	1	.001	.469		

Table 4. Logistic Regression Analysis of Lifestyle Related/ Modifiable Risk Factors

DISCUSSION

In the present study overall prevalence of hypertension was found to be 21.27%, which is similar to NFHS 4 survey carried out in India (2012 - 14).^[5] Prevalence was found slightly more among males. Hypertension among adolescent/teens aged (13 - 19) years was 4.7%, only 14 subjects out of total 300 were found hypertensive. Prevalence of pre-hypertension was 14.5%, which was maximum 30.8% in age group (20 - 30) years. In various paediatric hypertension studies based on the use of $\geq$ 95th percentile to define hypertension, it would be expected that the prevalence of hypertension would be approximately 5%. In a cross-sectional study limited to the adolescent age, the prevalence of pre-hypertension and hypertension was determined in a cohort of 6,790 high school students (11 - 17 years). Using the recommended repeated BP measurements on those with an elevated initial BP measurement, the authors found that the prevalence of hypertension was 3.2% and the prevalence of pre-hypertension was 15.7% in adolescence. Another analysis of the same two data cohorts demonstrated an

overall increase in the prevalence of hypertension from 2.7% in the 1988 - 1994 survey to 3.7% in the 1999 - 2002 survey.^[6] Both analyses indicate that the increase in BP among children and adolescents was largely due to the increase in obesity.

Prevalence of hypertension amongst various age groups was found similar in another study done by Laxmaiah et al, risk of hypertension was nearly 2 and 5 times higher among $\geq$ 60 yrs. old subjects than subjects aged 20 - 35 yrs.^[7] Prevalence within income groups was maximum among high income group (Class-I) individuals and difference was statistically significant, similar to the study of Kashyap et al who found higher prevalence of hypertension among subjects of higher socio-economic status in rural areas.^[8] Similarly, Naresh et al also found positive family history was strongly associated with hypertension in rural population.^[9]

Results showed hypertension among study subjects with modifiable risk factors in the present study. Smoking is significantly associated with hypertension in this study. Mandani et al also found that smoking was significantly

associated with hypertension among the tribal population of Gujarat.^[10] Alcohol consumption associated with high prevalence of hypertension and this result was similar to Manimunda and Meshram et al^[11] study in tribal population. In the present study, there is high prevalence among sedentary and mild worker. The difference is statistically significant. Kandpal et al also found significant correlation of hypertension with activity.^[12]

BMI > 25 was significantly associated with hypertension. Gupta VK et al also found high prevalence of hypertension among overweight and obese tribals similar to this study.^[13]

Limitations

The design effect was not considered for sample size, which was supposed to be taken for cluster/stratified sampling.

CONCLUSION

Detection of pre-hypertension and hypertension in the adolescent age group is a significant finding of the study. Implementing population-wide policies to reduce behavioural risk factors including harmful use of alcohol, physical inactivity, overweight, obesity and high salt intake is essential in attaining the target of reducing the burden of hypertension. A total-risk approach needs to be adopted for early detection and cost-effective management of hypertension in order to prevent heart attacks, strokes and other complications.

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