



A Study of Hypertension and Its Risk Factors among Rural Population in the Field Practice Area of Mahatma Gandhi Medical College and Hospital, Jaipur

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Abstract

Background: Hypertension is an important global health issue of the 21st century, which has developed together with rapid economic growth, urbanization, aging population, changing life style and other unhealthy behaviours. The rising burden is big concern especially in rural areas due to unawareness about screening and inadequate approach to health care resources. The present study was planned to measure the prevalence of hypertension and its association with sociodemographic and lifestyle risk factors in rural population of Jaipur.

Material and Methods: This cross sectional, community based study was conducted in the rural field practice area of MGMC, Jaipur. A total 1700 adult participants, aged between 18 to 60 years were enrolled by systemic random sampling method. All the participants were personally contacted in their house, interviewed and examined using predesigned and pretested questionnaire. Baseline data regarding sociodemographic characteristics, behavioural practices and blood pressure were noted down in proforma. JNC-7 diagnostic criteria (SBP \geq 140 mmHg and/or DBP \geq 90 mmHg) was used for hypertension. Statistical analysis was done by Chi-Square test by using SPSS version 17.

Results: The prevalence of hypertension in our study population was 14.24%. Increasing age, illiteracy, higher SES, sedentary occupation, reduced physical activity, excess intake of salt, family history of hypertension and consumption of tobacco and alcohol were found to be significant risk factor for hypertension.

Conclusion: The prevalence of hypertension among adults in rural field practice area is relatively high. Urgent attention is required to arrest its rising trends, by raising public awareness and identifying it at an early stage and its related factors through primary prevention and further control.

Keywords: Hypertension, rural population, risk factors.

Introduction

Hypertension is an important health issue of the 21st century and one of the major unseen forces

behind the global burden of non-communicable diseases (NCDs). Worldwide, 1.39 billion people have hypertension; of these, two thirds are living

in developing Nations^[1-2]. The burden is rising and it is likely to increase by 60% to be 1.56 billion individuals by 2025 and will be 2 fold higher in developing countries^[3]. India, the world second largest democracy, is under phase of epidemiological transition. Infectious diseases are present on one hand while on one other hand non-communicable diseases like hypertension is assuming alarming proportions. In fact it is now most common chronic disease and occurrence is high among urban as well rural populations.

The prevalence is quite lower in rural areas but increasing steadily and approaching to the trends as in urban areas, due to profound lifestyle changes including unhealthy consumption of food, substance abuse, sedentary habits without adequate physical activity and other unhealthy behaviours^[4]. The rising prevalence of hypertension is a big concern especially in rural population because of unawareness about screening and less availability of health care resources. In addition, hypertension is an asymptomatic in the early stage, until its complications develops. In India, where close to 70% of the population live in rural areas, there is paucity of data regarding hypertension prevalence and its causing risk factors. Therefore, present study was conducted to estimate the prevalence of hypertension and its association with various risk factors in rural population of Vatika, District Jaipur.

Material and Methods

Study Area: A community based cross-sectional study was conducted among adult's, aged between 18 to 60 years, residing at Vatika Village, which is a Rural Health Training Centre (R.H.T.C) of Department of Community Medicine, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur.

Approval from Institutional Ethics Committee (MGMCH/IEC/JPR/2016/316) was taken before commencement of the work. An informed and written consent was obtained from all participants, after complete description of the study and its

health benefits. Following which, all the participants of the study were interviewed by using predesigned and pre-tested proforma. Subjects were selected according to their inclusion and the exclusion criteria of the study.

Inclusion Criteria

- An individual age between 18 to 60 years
- Resident of the Vatika Village
- Willing to participate in the study

Exclusion Criteria

- An individual age below 18 years and above 60 years
- Any person suffering from acute and chronic illnesses like cardiovascular diseases, chronic kidney diseases etc.
- Person not a permanent resident of Vatika Village
- Females who are pregnant
- Person unwilling to participate in the study in spite of motivation

Study Period

The study was carried out for a period of 1.5 years from April 2016 to October 2017. The field work was undertaken from September 2016 to February 2017.

Sample Size

Sample size was calculated by the formula-
 $n = z_{\alpha}^2 \times p \times q / d^2$

The prevalence of hypertension among adult population is 22.9 percent^[5]. By taking prevalence (p) 22.9% and absolute error (d) 2%, sample size comes out to be 1695.67≈1700.

Sampling Method

Systemic random sampling procedure was used to select the study population. The total population of study place was 10590. The total numbers of houses were 1677 as per Health Survey Register of Local Primary Health Center. After numbering the houses, first house was chosen randomly. Then every alternate house was selected till reached the desired number of samples.

Study Tool and Variables

A total 1700 subjects were enrolled in the study. All the subjects were personally contacted in their house, interviewed and examined using predesigned and pretested questionnaire. On visiting the family, baseline data regarding sociodemographic and behavioural practices were noted down in proforma and person aged between 18 to 60 years were screened. Blood pressure was measured in the right upper limb with mercury sphygmomanometer in a sitting position as per standard guidelines. Two reading were taken and average was used for analysis. Diagnosis of hypertension (SBP \geq 140; DBP \geq 90) was made as per the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7)^[6].

Operational Definitions

SES - Modified B.G. Prasad Classification^[7] for the year 2015 which is based on per capita income per month in Indian Rupees was used for calculation of socioeconomic status (SES).

Physical Activity- A person was considered physically active if he/she doing 30 minutes of daily brisk walk on most days (5) of the week and physically inactive if he/she not doing any kind of exercise per day.

Dietary Habits: Diet history was noted as stated by subject into vegetarian, non-vegetarian and mixed type. Vegetarian was defined as those who consume cereals, pulses, vegetables, fruits, nuts, milk and milk product. Mixed diet includes eggs, meat in addition to vegetarian diet.

Salt Intake: It was assessed by enquiring whether they had the habit of consuming papad, chutney, pickle or adding extra table salt on the top of cooked food and salad daily.

Tobacco User: Those who were using tobacco products at time of survey in any form either smokeless or smoking tobacco daily or occasionally for at least past one year.

Alcohol User: A person who is taking alcohol at time of study. The amount of alcohol consumed per week (upto 180 ml, upto 375 ml or more than

375 ml) and duration of consumption were recorded.

Family History of Hypertension: A person was considered to have a family H/O hypertension if either one or both the parents of the person had hypertension.

Hypertension: A person was considered hypertensive if –

1. SBP \geq 140 and/or DBP \geq 90 mmHg
2. Person already on anti-hypertensive treatment
 - Normal (SBP <120 mmHg and DBP <80 mmHg respectively),
 - Pre-hypertension (SBP=120-139 and/or DBP=80-89 mmHg),
 - Stage I hypertension (SBP=140-159 and/ or DBP=90-99 mmHg) and
 - Stage II hypertension (SBP= \geq 160 and /or \geq 100 mmHg)

Statistical Analysis

Statistical analysis was performed using the SPSS version 17 (SPSS Inc., Version 17, Chicago). Categorical variables were presented in number and percentage. Continuous variables were expressed as mean with standard deviation (SD). Association of hypertension with different variables were analysed by Chi-Square test. Statistical significance was established at $p < 0.05$.

Results

Sociodemographic Characteristics

A total 1700 subjects were included in the study. Of these 843 (49.59%) were male and 857 (50.41%) were female. Majority of subjects were between age group of 18-25 years (28.24%). Mean age of the study subjects was 36.82 ± 13.08 years. The age wise distribution of the participants was typical of a developing country i.e A large proportion of young people compared to older people.

With regards to literacy, 12.82% of the subjects were illiterate, followed by primary (11.29%), middle (27.76%), secondary (23.47%), higher secondary (11.23%) and 13.41% had completed graduation and above. Majority of them were employed in the agricultural sector or elementary

jobs such as bus drivers, house painters, electricians, plumber etc.

Regarding religion, 84.18% (n=1431) were Hindu, 7.00% (n=119) Muslims and 8.82% (n=150) belongs to other religion. Most of the subjects were married (82.82%) and from nuclear family (47.18%). As per modified B.G. Prasad's

socioeconomic scale, 80.17% (n=1363) of the subjects belongs to middle class [upper middle (26.35%), middle class (30.59%), lower middle class (17.35%)], 16.06% to upper class and 9.65% to lower class. 15.76% (n=268) of the subject had family history of hypertension (Table-1).

Table-1 Distribution of study subjects according to Sociodemographic Variables

Variables	Male	Female	Total
	n (%)	n (%)	n (%)
Age (Mean±SD)	37.12±13.11	36.53±13.05	36.82±13.08
• 18-25	230 (27.28)	250 (29.17)	480 (28.24)
• 26-35	174 (20.64)	171 (19.95)	345 (20.29)
• 36-45	160 (18.98)	170 (19.84)	330 (19.41)
• 46-55	145 (17.20)	135 (15.75)	280 (16.47)
• 56-60	134 (15.89)	131 (15.29)	265 (15.59)
Education			
• Illiterate	98 (11.63)	120 (14.00)	218 (12.82)
• Primary (5 th)	104 (12.34)	88 (10.27)	192 (11.29)
• Middle (8 th)	232 (27.52)	240 (28.00)	472 (27.76)
• Secondary (10 th)	201 (23.84)	198 (23.10)	399 (23.47)
• Higher sec. (12 th)	90 (10.68)	101 (11.78)	191 (11.23)
• Graduate & above	118 (13.99)	110 (12.84)	228 (13.41)
Occupation			
• Unemployed	113 (13.40)	120 (14.00)	233 (13.71)
• Unskilled Worker	110 (13.05)	118 (13.77)	228 (13.41)
• Semiskilled Worker	84 (9.96)	90 (10.50)	174 (10.23)
• Skilled Worker	80 (9.49)	86 (10.03)	166 (9.76)
• Clerical/Farmer/Shopkeeper	222 (26.33)	230 (26.84)	452 (26.59)
• Semi-Professional	113 (13.40)	111 (12.95)	224 (13.17)
• Professional	121 (14.35)	102 (11.90)	223 (13.12)
Marital Status			
• Married	702 (83.27)	706 (82.38)	1408 (82.82)
• Unmarried	64 (7.59)	55 (6.42)	119 (7.00)
• Widower/Divorcee	77 (9.13)	96 (11.20)	173 (10.18)
Religion			
• Hindu	720 (85.41)	711 (82.96)	1431 (84.18)
• Muslim	55 (6.52)	64 (7.47)	119 (7.00)
• Others	62 (7.35)	82 (9.57)	150 (8.82)
Family Type			
• Nuclear	405 (48.04)	397 (46.32)	802 (47.18)
• Nuclear Ext.	275 (32.62)	286 (33.37)	561 (33.00)
• Joint	163 (19.34)	174 (20.30)	337 (19.82)
Socioeconomic Status			
• Class I	138 (16.37)	135 (15.75)	273 (16.06)
• Class II	220 (26.10)	228 (26.60)	448 (26.35)
• Class III	256 (30.37)	264 (30.81)	520 (30.59)
• Class IV	159 (18.86)	136 (15.87)	295 (17.35)
• Class V	70 (8.30)	94 (10.97)	164 (9.65)
Family H/O HTN			
• Yes	139 (16.49)	129 (15.05)	268 (15.76)
• No	704 (83.51)	728 (84.95)	1432 (84.24)

Behavioural Practices

Among the total study participants, more than half (53.88%, n=916), of the subjects had regular

physical activity and rest 784 (46.12) had sedentary life. Majority of the subjects (73.82%) were consuming vegetarian diet, 7.65% non-

vegetarian diet and rest (18.53%) were consuming mixed type diet. 66% (n=1122) of them were taking more than 5 gm salt per day. 54.42% (n=925) were taking 10-20 ml fat and 45.59% (n=775) were more than 20 ml fat per day.

With regards to substance abuse, 30.94% were consuming tobacco [either smoking or consuming

smokeless tobacco products (like pan with tobacco or tobacco chewing or pan masala)]. In male 50.65% were taking tobacco while in female only 11.55% were taking tobacco. 28.53% (n=485) of the them were consuming alcohol. In male 52.07% were consuming alcohol while in female only 5.36% were taking alcohol (Table-2).

Table-2 Distribution of study subjects according to Behavioural Practices

Variables	Male	Female	Total
	n (%)	n (%)	n (%)
Physical Activity			
• Physical inactive	398 (47.21)	386 (45.04)	784 (46.12)
• Physical active	445 (52.79)	471 (54.96)	916 (53.88)
Diet History			
• Vegetarian	615 (72.95)	640 (74.68)	1255 (73.82)
• Non- Vegetarian	70 (8.30)	60 (7.00)	130 (7.65)
• Mixed	158 (18.74)	157 (18.32)	315 (18.53)
Salt Intake			
• Less than 5 gm/day	286 (33.93)	292 (34.07)	578 (34.00)
• More than 5gm/day	557 (66.07)	565 (65.93)	1122 (66.00)
Fat Intake			
• 10-20 ml	458 (54.32)	467 (54.50)	925 (54.42)
• More than 20 ml	385 (45.67)	390 (45.50)	775 (45.59)
Tobacco Consumption			
• Yes	427 (50.65)	99 (11.55)	526 (30.94)
• No	416 (49.35)	758 (88.45)	1174 (69.06)
Alcohol Consumption			
• Yes	439 (52.07)	46 (5.36)	485 (28.53)
• No	404 (47.92)	811 (94.63)	1215 (71.47)

Prevalence of Hypertension

In our study the overall prevalence of hypertension was 14.24%. Grade I hypertension was present in 9.47% and Grade II in 4.76 % of the subjects. A larger proportion of the study participant's i.e 45.59% had prehypertension. With regards to

gender, proportion of hypertension was slightly more in male (14.59%) than female (13.89%) but the difference was found to be statistically insignificant ($p>0.05$) [Table-3]. Out of the 242 hypertensives, 30.16% (n=73) were known cases and 69.83% (n=169) were newly diagnosed cases.

Table-3 Distribution of study subjects according to Blood Pressure Status

Blood Pressure (mmHg)	Male	Female	Total
	n (%)	n (%)	n (%)
Normal	380 (45.08)	320 (37.33)	700 (41.18)
Pre-HTN	340 (40.33)	418 (48.77)	758 (44.59)
Hypertension	123 (14.59)	119 (13.89)	242 (14.24)
• Stage-I	86 (10.20)	75 (8.75)	161 (9.47)
• Stage-II	37 (4.38)	44 (5.13)	81 (4.76)
Total	843 (49.58)	857 (50.41)	1700 (100)

As shown in Table-4, prevalence of hypertension increased with advancing age; it was 3.75% in the age group of 18-25 years which gradually increased to 29.43% in the age group of 56-60

years. Mean systolic and diastolic blood pressure also showed a gradual increase with age. The rate of increase in systolic blood pressure was more than diastolic blood pressure.

Table-4 Hypertensive status according to Age

Age (in years)	Hypertensive n (%)	Normotensive n (%)	SBP (mmHg)	DBP (mmHg)	χ^2	p-value
18-25	18(3.75)	462 (96.25)	109.87±17.70	74.37±14.79	127.66(4)	<i>p</i> <0.001
26-35	25(7.24)	320(92.75)	119.13±17.76	78.02±17.76		
36-45	53(16.06)	277(83.94)	128.40±18.76	84.94±15.34		
46-55	68(24.28)	212(75.71)	134.86±10.86	86.30±16.93		
56-60	78(29.43)	187(70.57)	138.62±15.64	87.12±17.53		
Total	242 (12.42)	1458(85.76)	124.75±17.98	81.58±16.56		

Table-5 shows that prevalence of hypertension was high in illiterate subjects (19.72%), than who were educated up to primary (17.71%), middle (13.14%), secondary (12.03%), higher secondary (8.90%), and had received education up to graduate and above (16.67%).As per socioeconomic status, hypertension was quite more common in the subjects belongs to upper socioeconomic class, compared to lower socioeconomic class. The difference was found to be statistically significant (*p*<0.05).

The occurrence of hypertension in subjects with sedentary occupation such as professionals, senior

officials, and managers was significantly high than subjects with non sedentary occupations like farmers, daily wage workers, coolie, and house maids. Out of the 242 hypertensives, 21.90% (n=53) of the subjects had a family history of hypertension. The prevalence of hypertension was significantly higher (*p*=0.004) in subjects who had family history of hypertension (19.78%) than who did not (13.20%). No significant association of hypertension was observed with marital status of the subjects, religion and type of family.

Table-5 Hypertension with Sociodemographic Characteristics

Variables	Total n(%)	Hypertensive n (%)	Normotensive n (%)	χ^2	p-value
Education					
Illiterate	218 (12.82)	43 (19.72)	175 (80.28)	14.89 (5)	<i>P</i> <0.05
Primary	192 (11.29)	34 (17.71)	158 (82.29)		
Middle	472 (27.76)	62 (13.14)	410 (86.86)		
Secondary	399 (23.47)	48 (12.03)	351 (87.97)		
Higher Sec	191 (11.23)	17 (8.90)	174 (91.10)		
Graduate & above	228 (13.41)	38 (16.67)	190 (83.33)		
Occupation					
Unemployed	233 (13.71)	41 (17.60)	192 (82.40)	16.77 (6)	<i>P</i> <0.05
Unskilled worker	228 (13.41)	34 (14.91)	194 (85.09)		
Semi Skilled worker	174 (10.23)	21 (12.07)	153 (87.93)		
Skilled worker	166 (9.76)	21 (12.65)	145 (87.35)		
Farmer	452 (26.59)	44 (9.73)	408 (90.27)		
Semi-professional	224 (13.17)	38 (16.96)	186 (83.04)		
Professional	223 (13.12)	43 (19.28)	180 (80.72)		
Marital Status					
Married	1408 (82.82)	204 (14.49)	1204 (85.51)	3.93 (2)	<i>P</i> >0.05
Unmarried	119 (7.00)	10 (8.40)	109 (91.59)		
Widower/divorcee	173 (10.18)	28 (16.18)	145 (83.82)		
Religion					
Hindu	1431 (84.17)	207 (14.46)	1224 (85.53)	3.66 (2)	<i>P</i> >0.05
Muslim	119 (7.00)	17 (14.28)	102 (85.71)		
Others	150 (8.82)	18 (12.00)	132 (88.00)		
Type of Family					
Nuclear	802 (47.18)	124 (15.46)	678 (84.54)	2.99 (2)	<i>P</i> >0.05
Nuclear Ext.	561 (33.00)	79 (14.08)	482 (85.91)		
Joint	337 (19.82)	39 (11.57)	298 (88.43)		
Socioeconomic Status					
Upper Class I	273 (16.06)	54 (19.78)	219 (80.22)	13.05 (4)	<i>P</i> <0.05
Upper Middle Class II	448 (26.35)	71 (15.85)	377 (84.15)		
Middle Class III	520 (30.59)	60 (11.54)	460 (88.46)		
Lower Middle Class IV	295 (17.35)	40 (13.55)	255 (86.44)		
Lower Class V	164 (9.65)	17 (10.36)	147 (89.63)		
Family H/O HTN					
Yes	268 (15.76)	53 (19.78)	215 (80.22)	8.00(1)	<i>P</i> <0.01
No	1432 (84.24)	189 (13.20)	1243 (86.80)		

As illustrated in table-6, more than half (53.71%; n=130) of the hypertensive subjects were engaged in regular physical activity. Majority of them (72.31%, n=175) were consuming more than 5 gm salt per day. The prevalence of hypertension was significantly high in subjects who were physically inactive ($p<0.05$) and taking excess amount of salt per day (>5 gm/day; $p<0.05$). In hypertensives, nearly 1/3rd of the subjects (34.71%; n=84) were consuming alcohol. The prevalence of hypertension in alcohol users was 17.32% and in non users it was 13.0 percent. Out of the 242 hypertensives, 38.02% (n=92) of the subjects were either smoking

tobacco or consuming smokeless tobacco products. The occurrence of hypertension in tobacco users was 17.49% and in non users it was 12.78%. A significant association of hypertension was observed with tobacco ($p=0.010$) and alcohol consumption ($p=0.021$). As per dietary habits of the hypertensive subjects, majority were found to consume vegetarian diet 182 (75.21%), and taking 10-20 ml fat per day (52.48%; n=127). However, our study did not reveal any significant association of hypertension with dietary habits and fat intake of the subjects ($p>0.05$).

Table-6 Hypertension with Behavioural Characteristics

Variables	Total n(%)	Hypertensive n (%)	Normotensive n (%)	χ^2	p-value
Physical Activity					
Yes	784 (46.12)	130 (16.58)	654 (44.85)	6.56(1)	$P<0.05$
No	916 (53.88)	112 (12.22)	804 (55.14)		
Visible Salt Intake					
Less than 5	578 (34.00)	67 (11.59)	511(88.41)	5.01(1)	$P<0.05$
More than 5	1122 (66.00)	175 (15.60)	947(84.40)		
Dietary Habits					
Vegetarian	1255 (73.82)	182 (14.50)	1073 (85.49)	5.32(2)	$P>0.05$
Non-Vegetarian	130 (7.65)	10 (7.69)	120 (92.31)		
Mixed	315 (18.53)	50 (15.87)	265 (84.13)		
Fat Intake/day					
10-20 ml	925 (54.42)	127 (13.73)	798 (86.27)	0.42(1)	$P>0.05$
More than 20 ml	775 (45.59)	115 (14.84)	660 (85.16)		
Alcohol Consumption					
Yes	485 (28.53)	84 (17.32)	401 (82.68)	5.18(1)	$P<0.05$
No	1215 (71.47)	158 (13.00)	1057 (86.99)		
Tobacco Consumption					
Yes	526 (30.94)	92 (17.49)	434 (82.51)	6.61(1)	$P<0.05$
No	1174 (69.05)	150 (12.78)	1024 (87.22)		

Discussion

In the present study, overall prevalence of hypertension was 14.24%. In hypertensives, 50.82% (n=123) were male and 49.18% (n=119) were female. Grade-I hypertension was present in 9.47% while grade II in 4.76% of subjects. 44.59% of participants had pre-hypertension. Out of the 242 hypertensives, 69.83% of the cases were newly diagnosed and 30.16% were known cases.

Findings of our study are comparable to data obtained by Gupta R *et al*^[8] in his study titled "Trends in hypertension epidemiology in India"

where the prevalence of hypertension has been reported to range between 12 to 17% among rural adults in Rajasthan, India. However, observations were differed from those given by the office of the Register General of India (10.0%) and WHO (22.6%)^[9,10].

Study by Parekh A *et al* (20.40%)^[11], Basu G and Biswas S (21.90%)^[12], Yuvaraj BY *et al* (18.30%)^[13], Pooja and Mittal Y (33.20%)^[14] and Meshram II *et al* (40%)^[15] reported higher prevalence of hypertension in rural population of India while Rao PC *et al* (4.89%)^[16], Madhukumar S *et al* (8.06%)^[17], and Thrift AG *et*

al (11.40%)^[18] showed lower prevalence. This disparity in results might be due to the difference in methodology, age range of the participants, dissimilar lifestyle and variations in socio-economic status, genetic make-up and biological diversity.

The prevalence of hypertension was found to be steadily increased with age. Lowest prevalence (3.75%) was seen in 18-25 years of age group which rose to 29.43% in 56 to 60 years of age group and the difference was statistically significant ($\chi^2=127.66$; $p<0.001$). The gradual increase in prevalence of hypertension with age is well documented. The main reason is that arteries and arterioles become less elastic due to atherosclerotic changes as people age. Changes in lifestyle, physical inactivity, stress, accumulation of environmental influences and the effects of genetically programmed senescence in body system are also important contributors^[19]. Singh PS et al^[20] observed 5.26 times higher prevalence among the older age group (more than 50 years of age) than 6.3% in individuals with less than 30 years of age and 18.1% in 30-50 years of age group in rural population of India. Ismail MM et al^[21] in a comparative study of hypertension among urban and rural population of South India found 6% prevalence of hypertension in the age group of 20 to 29 years, which increased to 52.4% for people of aged ≥ 70 years.

Gender wise, proportion of hypertension was more in males (14.59%) compared to females (13.89%) but statistically insignificant ($p>0.05$). Gupta R et al^[8] in Rajasthan, Mohan V et al^[22] in Chennai and Ismail MM et al^[21] in a coastal town of South India found high proportion of hypertension in Males. Similar results were also observed by Wasnik VR et al^[23] (14.3% among males and 12% in females). So, it is clear that in some regions of India hypertension is more prevalent among males than females.

The prevalence of hypertension according to education did not show a specific pattern of distribution. We found higher prevalence of hypertension in illiterate subjects (19.72%),

followed by individuals educated up to primary (17.71%) and then in individuals educated up to graduation and above (16.67%). Lower prevalence was seen in individuals educated up to higher secondary school level (8.90%) than in individuals educated up to secondary (12.03%) and middle school level (13.14%), but difference was found to be statistically significant ($\chi^2=14.89$; $p=0.010$). Higher prevalence of hypertension among the illiterate subjects indirectly shows the lack of awareness of the people about screening or may be due to other unhealthy behaviours. The Jaipur rural study^[24] had also reported a higher prevalence among illiterate or low education peoples. Similar results were observed by Verma M et al^[25] in rural population of North India (34.4%) and Sharma AK et al^[26] among desert based rural population of Rajasthan.

In the present study, hypertension was more prevalent in upper socioeconomic class (19.78%) as compared to lower socioeconomic class (10.36%). The difference was statistically significant ($\chi^2=13.05$; $p<0.05$). In upper socioeconomic class, higher prevalence of hypertension may be due to high rates of obesity, lack of physical activity, type of occupation and high mental stress. Our results are comparable with study done by Verma M et al^[25], which showed that prevalence of hypertension was higher in upper SEC (42.9%) than lower SEC (12.4%). Similar findings have been reported in rural populations of Sitapura by Kumar K et al^[27], Kokiwar PR et al^[28] in rural community of central India and Rajasker VD et al^[29] in rural area of Tamil Nadu. On the contrary, there are some studies that show that in many population, hypertension is more prevalent in the lower SEC, especially in the underdeveloped countries. In a national study by cardiology society of India, no such differences were observed between high and low SE groups^[30].

Subjects with sedentary occupations such as managers, senior officials, retired persons, housewives, and professionals had a higher prevalence of hypertension compared to non-

sedentary occupations such as farmers, maids, dhobis, daily wage workers, coolie, carpenter, plumber and house painters. The difference was found to be statistically significant ($\chi^2=16.77$; $p=0.010$). Similar results were also observed by Rajasekar VD *et al*^[29] in Puducherry, India where they found that people involved in sedentary occupations were at an increased risk of developing hypertension compared to those in non-sedentary occupations.

In our study, majority of the hypertensive subjects (84.29%) were married belongs to religion Hindu (85.54%), and from (51.24%) nuclear family. However, we did not found any association between marital status, religion, types of family and subsequent development of HTN ($p>0.05$). Among hypertensives, 21.90% of the subjects had a family history of hypertension. The occurrence of hypertension was significantly higher ($\chi^2=8.00$; $p=0.004$) in subjects who had family history of hypertension (19.78%) than who did not (13.20%). Family history of hypertension is a major risk factor for development of hypertension and several epidemiological studies have reported that 20-60 percent of essential hypertension is inherited and rest is acquired or environmental. In addition, Genetic studies have reported a polygenic inheritance of hypertension. Deswal BS *et al*^[31] found 4.86 times more risk of developing hypertension in 1st degree relatives as compared to those who did not have the family history.

Regarding behavioural habits of the hypertensive subjects, the occurrence of hypertension in physically inactive subjects was (16.58%) more than in active subjects (12.22%) ($\chi^2=6.56$; $p<0.05$). Jajoo UN *et al*^[32] observed that moderate and light activity population is more prone to have hypertension (1.49 times in male and 1.69 times female) compared to population engaged in heavy physical activity. Sedentary individuals have 20 to 50 percent increased risk of developing hypertension^[33]. Satheesh BC *et al*^[34], Bartwal J *et al*^[35], Verma M *et al*^[25], Kokiwar PR *et al*^[28] and Ismail MM *et al*^[21] found reduced

physical activity, to be a significant risk factors of hypertension.

The prevalence of hypertension in subjects consuming mixed diet was 15.87%, 14.50% in vegetarian subjects and 7.69% in non-vegetarians. We did not found any significant association between hypertension and dietary habits of subjects ($\chi^2=5.32$; $p>0.05$). As per fat intake per day, 52.48% of the hypertensive subjects were consuming 10-20 ml fat and 47.52% of the subjects were taking more than 20 ml fat per day. The prevalence of hypertension was 14.84% in hypertensives consuming more than 20 ml par day and 13.73% in subjects consuming less than 20 ml per day. Our study did not reveal any significant association between fat intake and hypertension ($\chi^2=0.425$; $p>0.05$).

A higher prevalence was observed in hypertensives taking more than 5 gm salt per day (15.60%), compared to taking less than 5 gm salt per day (11.59%). Excess salt intake was found to be a significant risk factor for the development of hypertension ($\chi^2=5.013$; $p=0.025$). Sodium is predominantly an extracellular cation and is a primary determinant of extracellular fluid volume (ECF). Sodium excretion is regulated by kidney and when its intake exceeds the capacity of kidney to excrete, initially vascular volume expands and cardiac output increases, which in turn increases the blood pressure. In a study on sodium intake and blood pressure in healthy individuals Ducher M *et al*^[36] found that 5 to 16 percent of healthy persons have salt dependent blood pressure and many more benefited from decrease dietary intake of salt. In the INTERSALT international study^[37], high intake of salt was found a risk factor for the development of hypertension.

In our study, prevalence of hypertension in tobacco users was 17.49% and in non users it was 12.78%. In tobacco users, 60.86% (n=56) were consuming tobacco products while 39.13% (n=36) were smoking tobacco. Most of the tobacco smokers, smoked predominantly beedi (77.77%; n=28) and the rest 22.22 (n=8) smoked cigarettes. A significant association was found between

tobacco consumption and hypertension ($\chi^2=6.61$; $p=0.010$). Tobacco smoke mainly contains nicotine and various toxic substances such as acetone, benzene, carbon monoxide, and hydrogen cyanide, all of these causes vasoconstriction which may increase the blood pressure. In a recent study by Ismail MM *et al*^[21], smokeless tobacco consumption was found a predominant risk factor for hypertension in the rural population of Karnataka, South India.

In the present study, 34.71% (n=84) of the hypertensives were consuming alcohol. Among alcoholics 22.61% (n=19) were taking <180 ml per day, 47.62% (n=40) were up to 375 ml and 29.76% (n=25) were more than 375 ml of alcohol per day. The prevalence of hypertension in alcohol users was 17.32% and in non users it was 13.00%. We observed a significant association in alcohol consumption and hypertension ($\chi^2=5.18$; $p=0.021$). The mechanisms by which alcohol causes elevation of blood pressure include a direct pressure effect of alcohol on the vessel wall, a sensitization of resistance vessels to presser substances, stimulation of sympathetic nervous system, and increased production of adrenocorticoid hormones^[38]. In a study among rural population of coastal town in South India, Ismail MM *et al*^[21] found 1.73 times odds of developing hypertension among those consuming alcohol than that of non-alcoholics. Similar findings were observed by Dhungana RR *et al*^[39] in recent study in Municipalities of Kathmandu, Nepal.

Conclusion

The prevalence of hypertension (14.24%) and prehypertension (44.59%) was higher in rural population of Vatika, District Jaipur, Rajasthan. Lifestyle related modifiable risk factors like, physical inactivity, excess intake of salt, consumption of tobacco and alcohol were found to be significantly associated with hypertension. This suggests that there is a significant scope to create awareness about the adverse effects of these multiple lifestyle habits. Community based

approaches for reduction of hypertension and its preventable risk factors should be started. Early screening as well as preventive and control strategies should be effectively used to reduce prevalence of hypertension and morbidity and premature mortality from hypertension.

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