Original Research Article

Risk factors appraisal for Hypertension among rural community of Western Maharashtra: A field-based study

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Abstract
Background: Hypertension is a leading risk factor for cardiovascular diseases. WHO has drawn attention to the fact that, Hypertension and related cardiovascular diseases are our modern epidemic. This contributes to high morbidity, cardiovascular disabilities and increasing mortality in the population. Such trends put an excessive burden on the quantum and quality of health care and necessitate more focus on more costly secondary and tertiary health care. **Methods:** A field based cross sectional descriptive study was conducted among rural population above 40 years. A pretested and structured questionnaire was used to record requisite information. A JNC VII criterion was used for blood pressure measurements. Data was analyzed with univariate and multivariate analysis. **Results:** Overall prevalence of hypertension among study participants observed was 5.92% (213 cases). Study participants having 'Sedentary' type of physical activity showed maximum number of cases (117 cases) than 'Moderate' or 'Heavy' physical activity group. Prevalence of hypertension was seen higher among upper class social-economic status population. Study participants consuming alcohol with varied frequency showed 158 cases out of total 213 cases while non-alcoholic participants (1995), had 55 cases of hypertension. **Conclusions:** The risk of hypertension increases with Advancing age positive family history and in male gender. Use of tobacco, alcohol consumption and resorting to non-vegetarian diet are the other contributory factors and the risk is more in the widowed persons as well as in those who are obese. Screening programmes with continuing health education for timely diagnosis and further treatment are to be stressed at policy formation.
Keywords: Hypertension, Risk factors, Physical activity.

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INTRODUCTION

During the recent years, the incidence of cardiovascular diseases (CVDs) has shown an increasing trend in India. The risk of developing CVDs in Indian population is much higher than that in other countries. Hypertension which in turn risk factor for CVD is the major cause of disability affecting the quality of life of millions of people each year. CVD deaths are concentrated in people of working age between 35–64 years, (in whom 35% of CVD deaths occur). The risk operates in a continuum, with modest elevation of many risk factors having a multiplicative effect. Identifying and modifying these risk factors have been recommended as a strategy for prevention and control of Hypertension in various settings.[1] Hypertension epidemic is driven by demographic and socioeconomic changes that influence the living, eating, and working habits of population. Such changes have resulted in population-wide escalation in maj or CVD risk factors like smoking, obesity, cholesterol concentrations, and dysglycemia and these risk factors have increased steeply

in many developing countries in the last two decades.[2]Hypertension is a leading risk factor for cardiovascular diseases. WHO has drawn attention to the fact that, Hypertension and related cardiovascular diseases are our modern epidemic i.e. the disease that affects younger population, and not an unavoidable attribute of ageing. It is estimated that if the incidence of such diseases is brought to zero, it would increase the life expectancy by 3 to 9 %. It is associated with high social cost.[3] In India, the problem is ever increasing. It is observed that, these problems are occurring with more frequency and severity and at the same time, the problems are observed at an earlier age. To add to this, females are also being increasingly affected. This contributes to high morbidity, cardiovascular disabilities and increasing mortality in the population. Such trends put an excessive burden on the quantum and quality of health care and necessitate more focus on more costly secondary and tertiary health care.[4] Elevated blood pressure have root in the changing life styles and behavioral patterns. Such diseases are amenable for prevention by simpler, non-costly, affordable and practicable non- pharmacological interventions.

Objectives: To study the prevalence of hypertension in the community with related demographic and socio-economic factors. To study and analyze observed risk factors of hypertension. To suggest the possible recommendations for prevention and control.

METHODOLOGY

A Cross sectional descriptive field-based study carried out at Tasgaon rural town, a field practice area of Government Medical College, Miraj which is located in Sangli district of Maharashtra and it caters to the major health needs of the local and nearby areas. It has total population of 39,300 according to the latest house to house survey.

The study population comprised of the individuals above 40 years of age. Study subjects were proportionately selected by Stratified random sampling from four sectors. These four sectors have been already defined and demarcated by Rural Health Training Centre, Tasgaon for the purpose of health care delivery. The sample size was calculated by taking anticipated prevalence of 5% from various previous studies and permissible error 15% of anticipated prevalence, sample size calculated as 3200. Considering 10 % approximate nonresponse rate, Total final sample size derived was rounded of to 3600. Ethical approval was obtained before start of the study.

Data collection and Analysis: A pretested and semi structured proforma was constructed and validated containing various information about desired parameters. Considering Inclusion and Exclusion (Not willing, having critical illnesses, less than 40 yrs. of age) criteria, all eligible study participants were informed the nature of

study and administered an informed consent. House to house survey was carried with the help of rural health training centre staff. Data was collected during the period of One year. (January 2007 to December 2007). Patients detected to be having active and acute complaints related to cardiovascular disorders were referred to the Government Medical College, Miraj for pertinent investigations and further management.

Standardized ISI marked mercury sphygmomanometer, Standardized Flexible metal Measuring tape and Standardized Weighing machine were the instruments used after requisite standardization and calibration to minimize the instrumental error. Using these instruments, Height, Weight and Blood pressure measurements were made as per the standard techniques. As per JNC criteria[5], Hypertension was defined. Systolic blood pressure ≥ 140 mmHg or Diastolic blood pressure ≥ 90 mmHg or the person is on antihypertensive medications. Collected data was checked and processed. Descriptive and inferential data analysis was carried out by using suitable tests of significance. Interpretation of data established through linking results of the present study with those of others along with some explanatory thoughts. Association between selected variables was tested for significance by using univariate as well as Multivariate Analysis techniques.

RESULTS

Out of total 3600 study participants, 2324 were males while 1276 were females. Minimum age recorded was 40 years (male) and maximum was 88 years (male). Mean age was 56 years (± 13.5) Age wise increase in the prevalence of hypertension was seen among study participants. Age group more than 60 years showed maximum cases of hypertension (61 cases). (Table I) Overall prevalence of hypertension among study participants observed was 5.92% (213 cases). In Males, it was 7.27% (169 cases) while in females, it was 3.44% (44 cases). Mean systolic blood pressure was 128 (± 13 mmHg) while diastolic blood pressure 81.3 mmHg (± 6.3mmHg) (Table II) Majority of the subject were belonging to Hindu religion (80.3%) while rest were Muslims and others. 91.8 % of the study population was currently married whereas 8.9% of the population was illiterate. Mental stress was observed in 83% of the participants with the help of mental stress score scale.[6] Occupation wise, around 20% population was not involved in any job, while about 12% involved in some managerial works. 'No job' Occupation group showed around one third of total cases (88 cases) of hypertension. 37% of the total study participants were having sedentary work. Study participants having 'Sedentary' type of physical activity showed maximum number of cases (117 cases) than 'Moderate' or 'Heavy' physical activity group.

With regard to socio-economic status, about one fourth population was belonging to lower socio-economic status according to Modified BG Prasad classification[5]. Prevalence of hypertension was seen higher among upper class social-economic status population (10.9 %) About 501 study participants had family history of hypertension. Around 2.3% participants were having body mass index more than 25. A total of 33% participants were belonging to mixed dietary pattern habit. Out of those, 67% of subjects having mixed dietary pattern were showing 75% of total cases (161 cases)where as 33% of subjects having vegetarian dietary pattern showed 25% of cases (52 cases). 44.5% of the study participants (all males) were consuming alcohol with varied frequency and 51.3 % were consuming some form of tobacco use. Study participants consuming alcohol with varied frequency showed 158 cases out of total 213 cases while non-alcoholic participants (1995), had 55 cases of hypertension. Similarly, habit of tobacco use in any form, smoking or smokeless, was seen in 51.3% of total participants (both gender). It was observed that 83 % of total hypertension cases where having habit of tobacco use.

Table I: Socio Demographic characteristics of Study Participants

Characteristics (Variable)	Male		Female		Total	
	No.	Cases	No.	Cases	No.	Cases
Age group (in years)						
41 ≥ 50	633	43	412	10	1045	53
51 ≥ 60	739	32	386	9	1125	41
61 ≥ 70	653	45	338	13	991	58
71 ≥ 80	263	32	127	9	390	41
> 80	36	17	13	3	49	20
Religion						
Hindu	1833	125	1056	38	2889	163
Muslim	445	42	210	06	655	48
Others	46	02	10	00	56	02
Marital status						
Married	2227	142	1078	16	3305	158
Separated	04	01	05	00	09	01
Widow/er	93	26	193	28	286	54
Educational status						
Illiterate	697	77	547	34	1244	111
Primary	451	28	504	5	955	33
Secondary	1124	56	225	5	1349	61
Graduation and above	52	8	0	0	52	8
Occupation						
No Job	517	72	245	16	762	88
Unskilled	214	7	120	4	334	11
Skilled	1530	83	910	24	2440	107
Managerial	63	7	1	0	64	7
Socio-Economic status						
Upper	44	04	11	02	55	06
Upper Middle	538	27	109	04	647	31
Middle	677	63	315	04	992	67
Lowe Middle	856	54	623	23	1479	77
Lower	209	21	218	11	427	32
Family history of HTN						
Negative	1960	90	1139	24	3099	114
Positive	364	79	137	20	501	99
Physical activity						
Sedentary	868	93	459	24	1327	117
Moderate	1258	67	713	19	1971	86
Heavy/strenuous	198	09	104	01	302	10
Dietary Pattern						
Vegetarian	717	33	476	19	1193	52
Mixed diet	1607	136	800	25	2407	161
Alcohol						
Non consumption	719	11	1276	44	1995	55

Alcohol consuming	1605	158	00	00	1605	158
Tobacco use						
Yes	1294	141	555	36	1849	177
No	1030	28	721	08	1751	36
BMI						
<25	1731	86	1004	28	2735	114
>25	593	83	272	16	865	99
Mental stress score						
No stress (0-40)	403	25	181	04	584	29
Less stress (41-200)	1606	94	915	30	2521	124
More stress (201+)	315	50	180	10	495	60

Table II: Prevalence of Hypertension

Characteristics	Male		Female		Total	
	No.	Cases	No.	Cases	No.	Cases
Total	2324	169 (7.27%)	1276	44 (3.44%)	3600	213 (5.92%)

In the present study, all in all 14 variables were analyzed in relation to occurrence of hypertension. These were subjected to univariate analysis using $\chi2$ test to study the level of statistical association either in total study group as well as in the male / female gender separately. These variables are summarized in the Table III.

Table III: Univariate results of Variables.

Sr.No.	Variable	χ2 value, degree of freedom, p value, inference
1	Age	Total χ2 = 57.43, df = 1, p < 0.001, significant. Male χ2=43.12, df = 1, p<0.001, significant. Female χ2 = 12.67, df = 1, p < 0.001, significant.
2	Gender	Total χ2 =21.6, df=1, P<0.01 Significant.
3	Marital status	Total - χ2 =72.8, df=1, P< 0.001 high sig. For Males - χ2= 60.3, df= 1, p<0.001, high sig. For Females- χ2=76.7, df= 1, p<0.001, high sig.
4	Literacy status	Total - χ2 = 38.4, df=4, P<0.001; high sig. For males - χ2 = 29.3, df=4, p<0.001; high sig. For females - χ2 = 22.7, df=2, p<0.001; high sig.
5	Occupation	Total χ2 =60.8, df=5, P<0.001 high sig. For Males - χ2 =53.2, df=5, P<0.001 high sig. For Females - χ2 = 9.2, df=3, P<0.001 high sig.
6	Family history	Total - χ2 = 201.14, df=1, p<0.001, high sig. Male - χ2 = 134.76, df= 1, p< 0.001, high sig. Females- χ2 = 57.92, df= 1, p<0.001, high sig.
7	Physical activity	Total -χ2 =32.2, df=2, P<0.001 high sig For Males - χ2=24.5, df=2, p<0.001, high sig For Females- χ2= 7.6, df=2, p<0.05, sig
8	Alcohol consumption	Total - χ2 =79.9, df=1, P< 0.001 high sig
9	Tobacco use	Total χ2 = 112.1, df=3, P<0.001 high sig For Males - χ2 = 64.1, df= 3, p<0.001, high sig For Females- χ2 = 35.1, df= 3, p<0.001, high sig
10	Obesity	Total - χ2 = 61.2, df=1, P<0.001, high sig For Males - χ2= 62.06, df= 1, p<0.001, high sig For Females- χ2= 5.25, df= 1, p<0.05, sig
11	Mental Stress	Total - χ2 = 33.8, df=2, P<0.001 high sig For Males - χ2= 40.0, df= 2, p<0.001, high sig For Females- χ2= 3.31, df= 1, p >0.5, Not Sig
12	Dietary pattern	Total - χ2 = 7.84, df=1, p<0.01, sig For Males - χ2= 11.15, df=1, p<0.001, high sig For Females- χ2= 0.64, df= 1, p>0.5, Not Sig
13	Religion	Total- χ2 = 4.0, df=2, P >0.5, Not Sig Males - χ2 = 4.20, df=2, p >0.5; Not Sig Females - χ2 = 0.13, df=2, p>0.5; Not Sig

14	Socioeconomic status	Total χ2 = 8.4, df=4, P>0.5 Not Sig
		For Males - χ2 = 11.9, df=4, p<0.5, significant.
		For Females - χ2 = 7.14, df= 3, p>0.5, Not Sig

Table IV: Results of Multivariate analysis.*

SR.No	VARIABLE	ODDS RATIO	95% CI	P VALUE
1	Gender			
	- Female	1 (Reference)		
	- Male	2.07	1.47-2.92	Sig
2	Marital Status			
	- Married	1 (Reference)		
	- Widow/er	3.49	2.44 -5.0	Sig
3	Socioeconomic status			
	- Lower class	1 (Reference)		
	- Higher class	1.26	0.95-1.68	Non Sig
4	Family History			
	- Positive	1 (Reference)		
	- Negative	7.26	5.39-9.77	Sig
5	Physical activity			
	- Heavy	1 (Reference)		
	- Sedentary	1.70	0.83- 3.48	Non Sig
	- Moderate	1.16	0.59-2.27	Non Sig
6	Diet			
	- Vegetarian	1 (Reference)		
	- Non vegetarian	1.60	1.16-2.21	Sig
7	Alcohol			
	- Non alcoholic	1 (Reference)		
	- Mild	2.02	0.94 – 4.35	Non Sig
	- Moderate	2.69	1.24 – 5.80	Sig
	- Severe	3.86	2.78 – 5.35	Sig
8	Tobacco			
	- Non tobacco user	1 (Reference)		
	- Mild	2.16	0.89 – 5.24	Non Sig
	- Moderate	2.77	1.56 – 4.91	Sig
	- Severe	5.13	3.52 – 7.47	Sig
9	Obesity			
	- < 25 BMI	1 (Reference)		
	- > 25 BMI	3.14	2.36-4.17	Sig
10	Mental Stress Score			
	- Score < 40	1 (Reference)		
	- Score > 40	1.20	1.10-1.80	Sig

(* Values for all variables are age adjusted.)

This shows that, out of 14 variables studied, total 2 variables were found to have no significant association in occurrence of hypertension. These variables were Physical activity and socioeconomic status. (Table IV)

In these variables, Family history topped the list of statistical significant variables followed by consumption of tobacco. Alcohol drinking ranked 3rd and loss of spouse stood out to be 4th variable. Obesity on the 5th position showed the Odd's ratio = 3.14 while male gender had also the OR= 2.7. The persons having the mixed dietary pattern also found to have statistical significant correlation with the OR= 1.6. Comparison of Univariate analysis based on chi square values and Multivariate analysis based on Odd's ratio indicated the matching and comparable results. From this, it could be said that, the variables influencing the occurrence of hypertension in the study group in the decreasing order of significance were - Family history, Tobacco use, Alcohol use, Marital status, Obesity, Male Gender, Dietary pattern and Mental stress.

DISCUSSION

A field based descriptive cross sectional study was carried out in the age group of above 40 years in a rural township. A total of 3600 participants were surveyed to know the prominent risk factors associated with hypertension. In the present study, prevalence of hypertension was found to be 5.92% which was comparable with other prevalence studies in rural areas.[1,4,7] Few studies [8,9] reported much

higher prevalence as compared to present study. This could be due to differences at nutritional habits, age accumulation effects and social and cultural diversities. Gender difference in prevalence was observed in present study, which showed higher Hypertension prevalence among Males. This finding was in line with studies done earlier at national level[8]. This could be ascribed to, nutritional factors and lifestyle risk factors like smoking, tobacco chewing and alcohol consumption apart from psychosocial stress. The rise in the number of cases with increasing age was found to be statistically significant (P<0.001). Previous few studies reported similar increasing prevalence with age[4,9,10,11]. It is speculated that due to ageing process and cumulative socio-cultural-environmental factors that lead to rise in prevalence with age. Whereas, Religion wise and socioeconomic status wise difference was not statistically significant in the present study. Possible reasons could be that, in higher SES stratum, the sedentary work, obesity and stress perception could be attributable while as, in Lower SES stratum, higher daily living stress, substance abuse might be the factors operating. The study findings could be comparable with few studies [10,11,12]. Prevalence of Hypertension was seen more in Widow/widower group (18.64%) than Married group. (4.8%) Similarly, Illiterate group showed 8.9% HTN prevalence as compared to 4.32% in Literate group. Such findings are in unison with few previous studies. [4,10,13] When comparison were made between people with 'No Job' and rest of the people 'doing one or the other job', the prevalence was seen more in later group. Various comparative accounts of other studies showed similar results.[10,11,13] In Present study, Multivariate analysis showed significant difference amongst participants having positive family history of Hypertension (19.76%) compared to rest of the participants. Comparable results were given by few other studies [10,14,15] which points out towards strong genetic component as well as possible role of dietary habits which do run in the families. Study participants involved in sedentary type of Physical activity were found to be having higher prevalence of hypertension on univariate analysis, but on Multivariate analysis, it was not statistically significant. (OR- 1.76, 95% CI 0.83- 3.48) Contrary to this, many study reported higher prevalence among sedentary wok pattern.[16,17] Significant association was seen in dietary pattern and hypertension in present study. Among participants having mixed dietary pattern had 6.68% prevalence compared to 4.35% among Vegetarian diet participants. (OR - 1.6 CI -1.16-2.21) Many studies reported similar findings [14,18]which could be due to some components of animal products, high calorie / fat intake responsible. Non-alcoholic group showed less prevalence of hypertension as compared to alcoholic group. ($\chi 2$ =79.9, df=1, P< 0.001) And, subjects using any

form of tobacco had higher prevalence of hypertension compared to their counterpart. ($\chi 2$ = 112.1, df=3, P<0.001). Shikha Singh *et al.*[8] (2017) and few other studies [18,19] also reported similar results where tobacco use known to be important risk factor for higher hypertension prevalence. Obesity and prevalence of hypertension was seen statistical significant. BMI > 25 had 11.4% prevalence while three times less prevalence in non-obese was seen in present study. Rastogi T. *et al.* (2004)[20] reported similar findings. BMI is an indicator of obesity which is a direct hypothesized risk factor for hypertension. Multivariate analysis showed significant association between mental stress and hypertension prevalence. (OR - 1.2 CI -1.10-1.80). Gupta R. *et al.*[21] reported findings in unison with present study. Whereas some studies [22]found no relation in between them.

CONCLUSIONS

A field based descriptive cross-sectional study on hypertension with appreciation of both possible modifiable and non-modifiable risk factors was carried out in rural township of Western Maharashtra. From present study it can be concluded that, prevalence of hypertension is on the rise in rural area as well. Advancing age is one of the most important variables related to hypertension. The risk of hypertension increases with positive family history and in male gender. Use of tobacco in one or the other form, alcohol consumption and resorting to non-vegetarian diet are the other contributory factors and the risk is more in the widowed persons as well as in those who are obese. Screening programmes with continuing health education at rural areas for timely diagnosis and further treatment are to be stressed at policy formation. Recommendations for promoting increased physical activity and inclusion of vegetables in the diet while restricting alcohol and tobacco use with control of body weight is desired. Cross sectional nature of the study, limited age group and only rural area study are some of the limitations of the study.

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