To Know the Prevalence and Risk Factors of Isolated Systolic Hypertension Among Adults Aged 30 Years and Above in Davangere Taluk

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ABSTRACT

Background: The WHO has estimated that globally hypertension is directly responsible for about 62% of cerebrovascular disease and 49% of ischemic heart disease. The risks of stroke and coronary heart disease are directly related to both levels of systolic and diastolic blood pressure. Research studies has shown that Isolated systolic hypertension (ISH) confers a substantial cardiovascular risk and stoke, however prevention and treatment lead to lowering of cardiovascular morbidity and mortality.

Objectives: 1) To know the prevalence of Isolated Systolic Hypertension in population aged > 30 years of Davangere Taluk. 2) To identify risk factors of Isolated Systolic Hypertension.

Materials and methods: It are a Community based cross sectional study conducted among persons above 30 years of Davangere taluk. Statistical analysis was performed using Percentage, proportion, chi-square and multivariate analysis.

Results: A total of 2400 subjects were studied. Majority of the elderly in our study belonged to the age group of 60-69 years (59.5%) with the mean age of 65 years (SD±5.44).It was observed that majority of the elderly were males (55.4%), Hindu by religion (93.3%).In the present study the overall prevalence of ISH was 25%, which was 26.4% in males and 23.6% among females.

Conclusion: A significant increase in the prevalence of ISH was seen with an increase in age. Multivariate analysis showed age, high salt intake, less fruits consumption, lack of physical activity and high BMI were significant independent risk factors of ISH.

Key words: Age, Isolated systolic hypertension, risk factors.

INTRODUCTION

Hypertension is a major public health problem due to its high prevalence all around the world. Around 7.5 million deaths or 12.8% of the total of all annual deaths worldwide occur due to high blood pressure. It is predicted to be increased to 1.56 billion adults with hypertension in 2025[1].

Recent studies done in India in the last decade has reported varying prevalence of hypertension ranging from 17-47% in the adult population. The epidemiological transition has brought the advanced developments in the life style of human beings that now affect every facet of human existence. These changes have fuelled the epidemic of non-communicable diseases and hypertension is one among them[1-2]. Among the various subtypes of hypertension, isolated systolic hypertension is the important variant. Isolated systolic hypertension (ISH) is defined has raised systolic blood pressure ≥140 mmHg with normal diastolic blood pressure ≤90mmHg. It is highly prevalent in elderly population but less so in the younger and middle-aged adults (<40years of age) [2-3]. However, the clinical consequences of ISH

in the younger and middle-aged adults remain uncertain and which can be "pseudo" or "spurious" hypertension is still under debate. Studies done globally however indicate that raised systolic blood pressure (SBP) or diastolic blood pressure (DBP) is associated with higher risk of cardiovascular mortality. There are several factors predisposing to hypertension, which vary from country to country and even with the difference between urban and rural regions of the same place.[3-4] A recent systematic review by Anchala et al. found the overall prevalence of hypertension in India to be 29.8% with significant urban –rural difference.[4] There is a paucity of reliable estimates of the burden and distribution of cardiovascular risk factors. Epidemiological studies provide a scientific foundation for such an approach by quantifying the potential value of treating and preventing high blood pressure in the population. With this background, the present study was taken up with the following objectives.[3-5]

Objectives: 1) To know the prevalence of Isolated Systolic Hypertension in population aged > 30 years of Davangere Taluk. 2) To identify risk factors of Isolated Systolic Hypertension.

MATERIALS AND METHODS

This was a community based cross sectional study. Study population comprised of persons with age 30years and above of Davangere taluk. The study duration was for one year from 1st December 2014 to 30th November 2015.

Sample size: The sample size for the present study was calculated based on the available information from previous studies. Prevalence of ISH was taken 7%. Using this information following formula is used and number of persons to be screened was determined. $N = 4pq/l^2$ where N=sample size, p=estimated prevalence (7%), q=100-p=93, d=allowable error (15%). Sample size calculated was 2362.

Sampling method: Davangere taluk has total population of 602,523lakh, in which urban consists of 3,64523l lakh and rural consists of 2, 38000lakh (2011 census). Davangere rural has total of 166 villages and urban has total of 41 wards. Stratified random sampling technique with population proportionate to size was used to select the study sample. Among the 166 villages 5% of villages was selected i.e. totally 8 villages and out of 41 urban wards, as 10% i.e.4 wards were selected by simple random sampling using a lottery method. Applying population proportionate to size, 2/3rds of sample size i.e. from 2362 subjects, 1575 subjects rounded off to 1600 from urban wards and 787 subjects rounded off to 800 from rural villages, totally 2400 subjects were selected. From each of the selected 4 urban wards 400 subjects and 100 subjects from each of the selected 8

villages were interviewed to complete the required sample. The houses in each respective urban/rural area were selected by systematic random sampling. Depending upon the population of a particular urban/rural locality a random number was chosen by using the random number table and every nth house was selected for the study. This process was continued till the required sample size was completed, if this required sample was not met, subjects from the adjacent ward/village were chosen to complete the required sample. In the selected house only one subject aged above 30 years who fits into the inclusion criteria was randomly selected for the study.

Inclusion Criteria and Exclusion criteria: The selected study subjects≥ 30years, being permanent residents of the study area and who were willing to participate and with previously diagnosed hypertensives with or without treatment were included in the study. Subjects who were physically /psychiatric morbid and visitors of the house were excluded from the study.

Study Tool: The study was conducted using a predesigned, pretested, semi-structured questionnaire. Informed verbal consent was obtained from each of the participants and confidentiality of their responses was assured, and also the purpose of study was explained. Ethical Clearance was taken by the Ethical Committee of JJM Medical College.

BP Measurements: Subjects were made to sit quietly for 15 min with his/her leg uncrossed. Subjects were instructed to place the left arm on the table with the palm facing upward. Clothing was rolled up/removed on the arm, appropriate cuff size was used, 3 BP recordings with 3 min apart were recorded, and an average of the 2nd and 3rd reading was considered. Blood pressure was recorded to the nearest 1 mmHg using the electronic OMRON machine (Omron Corporation, Tokyo, Japan) which is validated and calibration of the OMRON monitor was done by mercury sphygmomanometer. Definition of ISH: ISH is defined as SBP of 140 mmHg or more and DBP <90 mmHg.

Data Analysis

Data were entered in Microsoft excel and analyzed using SPSS version 17. Statistical analysis was done using percentage, proportions using Z test, Pearson's chi-square tests for categorical data. For all the test "p" value of 0.005 or less was considered for the statistical significance. Multivariate analysis was used to estimate the association between the selected socio-demographic and life style related characteristics. The adjusted odds ratio with their 95% confidence interval (CI) was given as final predictors in the model.

RESULTS

Table: 1 and Table: 2 showing determinants of isolated systolic hypertension. A total of 2400 subjects were studied. Majority of the study participants belonged to the age group of 30-39 years (24.5%) with the mean age of 51 years (SD±13.92). It was observed that majority of the study subjects were females, (53.4%) residing in rural area (65.8%) and belonged to Hindu by religion (93.5%). Regarding their education one third were educated up to secondary school (25%). With regard to occupation majority were housewives (42%), married (93.7%) and belonged to nuclear family (72.2%). The modified BG Prasad classification revealed that majority of the subjects belonged to Class III (36.8%) socioeconomic status.

Table 1: Determinants of Isolated Systolic Hypertension (n=2400)

Determinants	Total (n=2400)	ISH cases (n=320)	Prevalence	p-value
Age group				
30-39	588	18	3	0.001*
40-49	564	37	6.5	
50-59	467	69	14.7	
60-69	466	111	23.8	
70-79	232	63	27.1	
>80	83	22	26.5	
Sex				
Male	1120	161	14.3	0.178
Female	1280	159	12.4	
Residence				
Urban	820	108	13.1	0.866
Rural	1580	212	13.4	
Religion				
Hindu	2244	301	13.4	0.86
Muslim	136	17	12.5	
Christian	20	2	10	
Education				
Illiterate	380	47	12.3	0.001*
Primary	283	32	11.3	
Secondary	524	67	12.7	
High school	474	86	18.1	
College	320	24	7.5	
Graduate	232	37	15.9	
Post-graduate	187	27	14.4	
Occupation				
Skilled	104	15	14.4	0.001*
Semiskilled	288	44	15.2	
Unskilled	173	21	12.2	
Semi-prof	448	57	12.7	
Professional	147	16	10.8	
Retired	104	12	11.5	
house wife	1084	137	12.6	
Unemployed	52	18	34.6	
Type of family				
Nuclear	1732	235	13.5	0.09
Joint	624	84	13.4	
Three generation	44	1	2.2	
Socioeconomic status				
Class I	488	59	12	0.128
Class II	700	103	14.7	
Class III	884	118	13.3	
Class IV	281	39	13.8	
Class V	47	2	2	

*p<0.05 is considered statistically significant. ISH: Isolated systolic hypertension

DISCUSSION

In our study over all prevalence of ISH was found to be 13.3%. The present results of ISH were comparable with the similar studies done by Gupta et al in Shimla (7.8%), Jagdal et al in Mongolia (6.9%) and Zheng et al in china (10.6%)[6,8,9]. Compared to other studies prevalence of ISH was found higher in our studies. The difference of prevalence observed between the present study and other studies with respect to isolated systolic hypertension could be due to social and cultural differences and lifestyle factors. In our study the highest (27%) prevalence of ISH was observed in 70-79 years age group and least (3%) was found in 30-39 years age group.The prevalence of ISH was found to raise with increase in age and association between age and ISH was found highly significant (p=0.001). Prevalence studies on ISH all round the world had evaluated the association between age and ISH. Among the few Indian studies, age was a significant risk factor as reported by Midha et al in Lucknow, Gupta et al in Shimla, Mandal et al in Uttaranchal and a study in China by Zheng et al.[5,6,7,9] In these mentioned studies, with increase in age, there was an increasing trend in prevalence of ISH. Similar finding was observed in our study also. Epidemiologic transition and increse in life expectancy accompanying the demographic change had been associated with increase in number and the burden of NCDs (non-communicable diseases) like hypertension and its subtypes.The present study also adds to this evidence.

In our study prevalence of ISH was found high among males (14.3%) as compared to females (12.4%). A similar finding was seen in the study by Midha et al in Lucknow, Gupta et al in Shimla and Mandal et a in Uttaranchall[5,6,7]. However, another study conducted in China by Zheng et al stated higher prevalence of ISH among females (11.2%) and was found statistically significant (OR 1.2939, 95% CI 1.94, 1.401)[9]. One of the possible explanation for this gender disparity in ISH prevalence could be partially due to biological sex difference and partially due to behavioral risk factors like smoking, alcohol consumption or lack of physical activity. In our study prevalence of ISH was found higher in rural areas (13.6%) compared to Urban area (13.1%). The present results were compared with the similar studies done by Jagdal et al in Mongolia (rural 7.6%, urban 6%), and also study by Midha et al in Lucknow reported higher prevalence in urban area compared to rural area (urban 6.2%, rural 4.5%)[8,5].

In our study prevalence of ISH was found high among hindus (13.4%) compared to other religion, where as similar study done by Midha et al in Lucknow reported higher prevalence in others (6.9% Muslim, Christian,and Sikh)[5].

The present study revealed the significant association between education and ISH (p<0.001). Prevalence of ISH was observed high among study subjects who were educated upto high school (18.1%). Prevalence among illiterates was 12.3%, followed by primary 11.3%, secondary 12.7%, pre-university 7.5%, graduates 15.9% and post-graduates 14.4%. A study by Mandal et al in Uttaranchal stated higher prevalence (7.7%) among illiterates when compared to literates[7].In our study prevalence of ISH was seen high among unemployed (34.6%) and least among the professionals (10.8%). Occupation as a risk factor was found statistically significant with ISH in the present study (p<0.001). In the present study prevalence of ISH was almost equal in both nuclear and joint family (13.5% and 13.4%). In our study prevalence of ISH was seen more among individuals with class II socio-economic status (14.7%) [Table:1]. The present results were not comparable to similar study by Midha et al in Lucknow (upper class 8.5%, lower 4.9%)[5].

Prevalence of ISH was seen high (14.4%) among subjects who had family history of hypertension. The present observations were supported by Midha et al (13.3%) study done at Lucknow and was found statistically significant (p=0.011)[5]. In this study prevalence of ISH was observed high (14.6%) among study subjects who had vegetarian type of diet compared to mixed type (12%).In our study prevalence of ISH was seen high (13.6%) among subjects who had < 5 servings of green leafy vegetables/day, this observation was supported by the similar study done by Jagdal et al (47.2%) in Mongolia[8].

In our study prevalence of ISH (13.9%) was found high among the individuals who had < 5 servings of fruits/day. Present study also stated the significant association between isolated systolic and with intake of fruits.In the present study prevalence of ISH was found almost equal in distribution with the intake of saturated and unsaturated fatty acids (13.2% and 13.3%).

In the present study the prevalence of ISH was found high among subjects with moderate level of activity (18.3%), where as prevalence among sedentary work was found 14.2% and lowest prevalence was seen among those with heavy type of activity (9%) and in this study association between physical activity and ISH was found statistically significant (p=<0.001). Similar study done by Midha et al in Lucknow stated prevalence of ISH increased with decreasing level of physical of activity and higher prevalence was found among those with sedentary life style (7.3%)[5].In our study the prevalenc of ISH was found high among Ex-smokers (37.5%), followed by 13.3% among Current

smokers and 12.7% among Non-smokers, and the association between the smoking and ISH was obsereved highly significat (p<0.001).

The present observation were compared with Midha et al in Lucknow, Gupta et al in Shimla, Jagdal et al in Mongolia, and Zheng et la in China, where prevalence of ISH was seen higher among current smokers compared to non- smokers[5,6,8,9].In our study the prevalence of ISH was found high among Ex-alcholics (25%) followed by current alcoholics (15.5%) and least among non-alcholics (12.9%). The present results corresponds with the similar study by Midha et al (22.2%) in Lucknow, Gupta et al (22.2%) in Shimla and in study by Jagdal et al in Mongolia, 74.8% were alcoholics compared to normotensive group (66.9%)[5,6,8].

Table 2: Determinants of Isolated Systolic Hypertension

Determinants	Total (n=2400)	ISH cases (n=320)	Prevalence	p-value
Family history				
Yes	624	90	14.4	0.352
No	1776	230	12.9	
Diet				
Vegetarian	1196	175	14.6	0.062
Mixed	1204	145	12	
Amount of salt intake per day				
<5gm/day	204	7	3.4	0.001*
>5gm/day	2196	313	14.2	
Type of oil				
Saturated FA	784	104	13.2	1.0
Unsaturated FA	1616	216	13.3	
Amount of green leafy vegetables intake				
Adequate	624	97	12.3	0.396
Inadequate	1776	243	13.6	
Amount of fruits intake				
>5 servings/day	236	18	7.6	0.007
<5 servings/day	2164	302	13.9	
Physical activity				
Sedentary	1304	186	14.2	0.001*
Moderate	376	69	18.3	
Heavy	720	65	9	
Smoking				
Non-smoker	2044	261	12.7	0.001*
Current smoker	308	41	13.3	
Ex-smoker	48	18	37.5	
Alcohol				
Non-alcoholic	2136	277	12.9	0.16
Current alcoholic	244	38	15.5	
Ex-alcoholic	20	5	25	
Stress				
Present	1190	161	13.5	0.841
Absent	1210	159	13.1	
BMI				
<18.5	64	2	3.1	0.04*
18.5-22.99	916	111	13.2	
23-24.9	1040	147	14.1	
>25	380	60	15.7	
Waist hip ratio (Male 1120)				
Normal	196	27	13.7	0.048
Excess	924	133	14.3	
Waist hip ratio (Female 1280)				
Normal	124	13	10.4	0.001*
Excess	1156	147	12.7	

*p<0.05 is considered statistically significant. ISH: Isolated systolic hypertension, BMI: Body mass index.

Table 3: Determinants of Isolated Systolic Hypertension- Multivariate Analysis

Risk factors	Adjusted odds ratio (95% CI)	p-value
Age 40-80 years	2.60 (1.29-5.24)	0.001
Excess Salt intake	1.49 (0.70-3.14)	0.001
Inadequate Fruits intake	0.55 (0.25-1.22)	0.007
Sedentary lifestyle	4.99 (0.61-40.59)	0.001
High BMI	1.170 (0.54-2.54)	0.043

In our study prevalence of ISH was found high (13.5%) among study subjects who had a positive history of stress in their life. Our study showed significant association between ISH and BMI (p=0.04), higher the BMI (body mass index) more the risk of developing ISH was observed. The present observation was supported by Midha et al in Lucknow, Gupta et al in Shimla and Zheng et al in China.[5,6,9] In the present study prevalence of ISH was found high among both males and females (14.3% and 12.7%) who had higher WHR (waist hip ratio) compared to normal [Table:2].

Table No.3 shows the multivariate analysis of the determinants of ISH. All the variables with p value less than 0.05 in bi variable analysis were entered as independent variables and ISH was entered as the dependent variable. Age, high salt intake, less fruit intake, lack of physical activity and high BMI were found to have adjusted OR (odds ratio) significant and emerged as positive predictors of ISH by the model. In the present study education, occupation, salt intake, fruits intake, physical activity, smoking and BMI were significantly associated with the ISH. [Table 2]

STUDY STRENGTHS AND LIMITATIONS

The principal strength of our study was three readings of BP measurement were obtained and done in the field. All. Subjects with abnormal BP were advised regarding appropriate medical care and lifestyle modifications. Measuring the waist and hip circumference which correlates better with metabolic syndrome and BMI also adds the strength of our study

Prevalence estimate was done based on a single occasion measurement of blood pressure. Risk factors were assessed in a subjective manner based on self-reporting and therefore their accuracy may be less than expected. We tried our best to Quantify ingestion of fat, salt, fruits and vegetables intake per day. Previously diagnosed hypertensives with or without treatment were also included in the study.

CONCLUSION

In our study, overall prevalence of ISH was found to be 13.3%. The prevalence of ISH among the elderly was found to be high among males (14.3.%) compared to females (12.4%). Prevalence of ISH was found high in rural areas (13.4%) compared to urban area (13.1%).The risk factors found to be significantly associated with ISH in our study were age, education, occupation, ,amount of salt intake per day, amount of fruits intake per day, smoking, BMI, and physical activity. Age ,High BMI, more salt intake, lack of physical activity and less fruits intake per day were found to have adjusted OR significant and emerged as positive predictors of ISH by the model.

Acknowledgements

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