



A Study of Prevalence of Hypertension among Urban and Rural Population and the Factors Associated with Hypertension

Ravi R Marinayakanakoppalu¹, Ashok C Nagaralu²

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Author's Affiliation:

¹Assistant professor, Department of Community medicine, PESIMSR, Kuppam; ²Professor, Department of Community medicine, JSSMC, Mysore

Correspondence:

Dr. Ravi R Marinayakanakoppalu
drravimr@gmail.com

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ABSTRACT

Hypertension is increasing rapidly in most low and middle income countries. The actual burden of Hypertension in urban and rural India is often under estimated. There is a felt need to define actual burden of the disease and to determine the geographic differences in the prevalence of hypertension and the risk factors associated.

Methodology: The present study was a across-sectional study conducted in Mysore district. Study included a total of 793 subjects. Individuals greater than 30 years of age were included. Data regarding basic demographic characteristics were collected along with anthropometric measurements including height and weight.

Results: Prevalence of hypertension was 31.4% and 25.0% from urban and rural area respectively & was statistically significant ($p=0.04$). Factors such as salt intake, tobacco consumption, alcohol consumption, stress had a significant association ($P < 0.05$).

Conclusion: The prevalence of hypertension was high in urban area (31.4%). Though prevalence of hypertension in rural area is low when compared to urban, it can be observed that it is increasing over time to match the urban rate. Present study emphasizes the fact that various risk factors are associated with the prevalence of hypertension.

Key words: Prevalence, Hypertension, risk factors, urban, rural, Mysore

INTRODUCTION

The world we live is changing at an ever increasing pace. Throughout the world, health of mankind is moulded by the same powerful forces, Demographic ageing, increased urbanization, and the globalization of unhealthy lifestyles.

The Harvard study presented at the World Congress of Cardiology in Dubai in April 2012 says around 900 million people in developing countries have high blood pressure but only one-third are aware of their disease¹. Moreover, only 100 million of these people receive treatment, while only 5% of the total are controlled.¹

The Global Burden of Disease study has reported hypertension as the 4th contributor to premature death in developed countries and the 7th in the developing countries.²

Hypertension is a major public health problem in India and its prevalence is rapidly increasing among both urban and rural populations.³ It is estimated that the prevalence of hypertension ranges from 20-40% in urban adults and 12-17% among rural adults^(4,5). The number of people with hypertension is projected to increase from 118 million in 2000 to 214 million in 2025, with nearly equal numbers of men and women⁵.

The actual burden of Hypertension in urban and rural India is often under estimated. Most of the cases go undetected and the patient's untreated leading to complications⁶. There is a felt need to define actual burden of the disease and to determine the geographic differences in the prevalence of hypertension and the risk factors associated with it. Hypertension it is readily detectable, easily treatable condition and if left untreated may leads to serious complications⁷. In considerable proportion of cases the disease tends to be asymptomatic for prolonged time, hence also labelled as 'Silent Killer'⁸. Hypertension is also considered as an 'Iceberg' disease' because unknown morbidity far exceeds the known morbidity⁹. Estimation of hypertension prevalence is therefore necessary to plan effective control measures. There is need for community based study in urban and rural population in view to determine the geographic differences in the prevalence of hypertension and the various risk factors associated with. The present study was carried out in this view to estimate the prevalence of Hypertension and determine the risk factors associated in the urban and rural areas of Mysore district.

Objectives: The objectives of the study were to estimate and compare the prevalence of hypertension among urban and Rural population; and to assess the factors associated with Hypertension among the study population

METHODOLOGY

Mysore district lies in the Southern Plateau and it is in the southernmost part of Karnataka State. It covers an area of 6854 sq. km. that is, 3.57 per cent of the state's total geographical area.

Study area: This study was conducted at Mysore city (urban) with all 65 wards being the sampling frame and Villages coming under Primary health centres of Suttur and Hadinaru (Rural).

Study population: National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS) recommends opportunistic screening for hypertension in individuals greater than 30years. Hence Study population comprised of persons aged above 30 years in urban and rural areas of Mysore district. Persons who are greater than 30 years of age was the inclusion criteria. Pregnant women, Persons who are not permanent residents of the study area, Severely morbid subjects hospitalized at the time of study, Persons not available during the period of study and People not giving consent for the study where excluded from the study.

SAMPLING: Considering the prevalence of Hypertension based on the literature review Gupta R⁴ and Kaur P et al¹⁰ for rural area, the minimum sample size estimated was 712. We included a minimum of 360 subjects from Mysore urban and 360 from Mysore rural comprising a total of 720 subjects.

Sampling Method:

Urban study area: A list of all the wards of Mysore city was taken from Mysore city Corporation. Utilizing this list as a sampling frame, four wards were selected by simple random sampling which was done using random number table. In each ward 100 subjects were covered to make it to the present sample size of 360 subjects by systematic random sampling. One person from each house was included in the study. In each ward there were around 1500 to 2000 houses. In the wards having average 1500 houses the sample interval was 15 i.e., 1500/100. To select the first house, simple random sampling was done by selecting a number between 1 to 15 and then by adding 15 to the next house. So every 15th house was taken till 100 houses were covered in each ward. In the wards having average of 2000 houses the sample interval was calculated as 20. To select the first house, simple random sampling was done by selecting a number between to 20 and then by adding 20 to the next house. So every 20th house was taken till 100 houses were covered in each ward. If the house which was selected was locked even after three visits, the next house was considered for the study. Door numbers which were put during census survey 2011 was used for identifying the houses.

Rural study area: Eight villages are covered by PHC Suttur and 15 villages are covered under PHC Hadinaru the rural field practice areas of JSS Medical college. Among these 23 villages four villages were selected by simple random sampling which was done using random number table. In each village 100 subjects were covered to make it to the present sample size of 360 subjects by systematic random sampling. One individual from each house was included in the study. Each village there were around 300 to 400 houses. In the village having average 300 houses the sample interval was three i.e., 300/100. To select the first house, simple random sampling was done by selecting a number between one to three and then by adding three to the next house. So every 3rd house was taken till 100 individuals were covered in each village.

Method of collection of data:

Approval of J.S.S Medical College Ethical committee was obtained for the study. All the subjects were personally contacted in the selected house and verbal consent was taken. Those willing to

participate were interviewed and examined using the pretested proforma. Study subjects were screened by taking two Blood Pressure (BP) reading at an interval of 15 minutes. BP was measured in sitting position, left arm. Arm rested at the level of heart. Average of the two readings was taken.

Definitions and measurements used in study:

Measurement of blood pressure: Blood pressure readings were taken by single observer for every individual with same sphygmomanometer throughout the study. After taking informed consent from participants total two readings were performed on each participant at 15 minutes interval in sitting position. Mean of two readings of systolic blood pressure (SBP) and diastolic blood pressure (DBP) are considered as representing blood pressure of participants. When SBP and DBP fall into different categories, the higher category was selected to classify individual's blood pressure. The readings are made of the close 2mm of Hg. mark on the scale.

Case definition of hypertension: Hypertension is considered according to JNC VII criteria as SBP of 140 mm Hg or greater, DBP of 90 mm Hg or greater or taking antihypertensive medication.

Statistical analysis: Chi-square test has been used to test the significance of prevalence of hypertension in association with various socio demographic factors. The odds ratio has been used to find the strength of relationship of various factors associated between hypertensive and non-hypertensive. 't-test', has been applied to compare means of study variables. Statistical software namely epi info version 22 was used for analysis of the data. Microsoft excel was used for data entry.

RESULTS

The study consisted of participants > 30 years of age. The mean age of the study population was 47.8 (9.65) years the mean age of the study subjects was 47.27 (10.31) years. Among the participants 52.2% and 47.8% were Males in urban and rural area respectively. Statistically significant differences were observed in the baseline characteristics between urban and rural participants (Table 1).

Majority of the study subjects both in urban and rural belonged to the age group of 41 to 50 years of age (36.5% in urban and 36% in rural) constituting an overall of 288 (36.2%) of study population. Majority of the females subjects (59.6%) in urban area belonged to 31-40 years and females subjects (58.2) from rural area belonged to 41-50 years.

The mean systolic blood pressure and mean diastolic blood pressure increased with the increase in the age group both in urban and rural population.

Table 1: Baseline characteristics among urban and rural study participants

Characteristics	Urban (%) N=389	Rural (%) N=405	P*
Age Group (Years)			
31- 40	114 (29.3)	125 (30.9)	<0.001**
41 - 50	142 (36.5)	146 (36.0)	
51 - 60	100 (25.7)	67 (16.5)	
61 - 70	33 (8.5)	63 (15.6)	
>71	0	4 (1)	
Sex			
Male	202 (51.9)	185 (45.7)	0.078
Female	187 (48.1)	220 (54.3)	
Level of Education			
Not literate	21 (5.4)	96 (23.8)	<0.001**
Primary schooling	62 (15.9)	87 (21.5)	
Secondary schooling	100 (25.7)	106 (26.2)	
PUC/Diploma	120 (30.8)	100 (24.8)	
Graduate	86 (22.1)	15 (3.7)	
Socio economic status			
Class I	1 (0.3)	0	<0.001**
Class II	50 (12.9)	1 (0.2)	
Class III	124 (31.9)	69 (17.1)	
Class IV	124 (31.9)	180 (44.6)	
Class V	90 (23.1)	154 (38.1)	
Type of family			
Nuclear	260 (66.8)	184 (45.5)	<0.001**
Joint	127 (32.6)	220 (54.5)	
Broken	2 (0.5)	0	
Diet			
Vegetarian	173 (44.5)	197 (48.8)	0.226
Mixed	216 (55.5)	207 (51.2)	
Alcohol consumption	58 (15.6)	46 (11.4)	0.08
Extra Salt Intake	211 (54.2)	277 (68.6)	<0.001**
Daily physical exercise	41 (10.5)	0 (0)	<0.01**
BMI			
Overweight	115 (29.8)	81 (20.1)	0.01**
Obese	7 (1.8)	4 (1)	
Stress	123 (31.6)	106 (26.3)	0.058
Family h/o Hypertension	91 (23.4)	65 (16.1)	0.007**

*Chi-square test, **statistically significant.

Table 2: Distribution of hypertensive and non-hypertensive study subjects

Category	Urban	Rural
Hypertensive	122 (31.4)	101 (25)
Non-hypertensive	267 (68.6)	303 (75)
Total	389 (100)	404 (100)

P value 0.046 (statistically significant) using Chi-square test; OR =1.37 (95% Confidence interval 1.005 - 1.870)

The difference in the mean systolic blood pressure and mean diastolic blood pressure between the age groups was statistically significant.

It was observed that prevalence of hypertension was more among urban population. The association between urban and rural study subjects was statistically significant. (table 2).

Table 3: Distribution based on behavioural risk factors

Risk Factors	Non- Hypertensive (N=650)	Hypertensive (N= 143)	Total (N=793)	OR	95% CI	P value
Extra table salt						
Present	346 (53.2)	96 (67.1)	442 (55.7)	1.79	1.22-2.62	0.002
Absent	304 (46.8)	47 (32.9)	351 (44.3)			
Diet						
Vegetarian	310 (47.7)	60 (42)	370 (46.7)	0.79	0.55-1.14	0.125
Mixed	340 (52.3)	83 (58)	423 (53.3)			
Tobacco consumption						
Present	77 (11.8)	37 (26.1)	114 (14.4)	2.62	1.68-4.08	<0.001
Absent	573 (88.2)	105 (73.9)	678 (85.6)			
Alcohol consumption						
Present	75 (11.5)	29 (20.3)	104 (13.1)	1.95	1.21-3.13	0.005
Absent	575 (88.5)	114 (79.7)	689 (86.9)			
Stress						
Present	164 (25.2)	65 (45.8)	229 (28.9)	2.5	1.72-3.63	<0.001
Absent	486 (74.8)	77 (54.2)	563 (71.1)			
Daily Physical exercise						
Present	39 (6)	2 (1.4)	41 (5.2)	0.22	0.05-0.93	0.013
Absent	611 (94)	141 (98.6)	752 (94.8)			

*Chi-square test, **statistically significant. Figures in parenthesis indicate percentages. OR: Odd's Ratio. CI: Confidence interval

Table 4: Comparison of means of behavioural risk factors

Behavioural risk factors	Non- Hypertensive (N=650)	Hypertensive (N= 143)	P value
Grams of salt (intake/day)	7.45 (2.06)	9.94 (1.34)	<0.001
Number of times (smoked/day)	6.57 (3.07)	8.13 (3.7)	0.029
Duration of tobacco (consumption)	10.69 (4.16)	15.37 (6.13)	<0.001
Number of drinks (per week)	7.31 (4.62)	10.96 (3.98)	<0.001
Duration of alcohol (intake)	9.84 (4.34)	11.54 (3.99)	0.074
BMI	23.42 (9.44)	24.52 (2.76)	0.17

All value are in Mean (SD); *Independent t-test, **statistically significant. BMI=Body mass index, SD=Standard deviation

Risk factors were analyzed with respect to the presence of normotension and prehypertension. Various behavioral risk factors such as extra salt intake, alcohol consumption were found to have significant association (table 3)

Knowledge attitude and practice regarding hypertension was poor among 60.7% of urban hypertensive subjects and 54% of rural hypertensive subjects. The association of KAP among urban and rural hypertensive subjects was statistically not significant.

Risk factors such as age, amount of alcohol consumption, amount of salt intake showed significant association with the both SBP and DBP [Table 4]

DISCUSSION

In the present study the prevalence of hypertension in urban area was estimated to be 31.4%. The study result is similar to the results of ICMR-INDIAB study¹¹, conducted in the urban residents of Tamil Nadu and Chandigarh with the prevalence of 31.5 and 30.7% respectively. Similar results were obtained in a meta-analysis conducted in the urban population of north, east, west and south India which showed the prevalence to be 28.8, 34.5, 35.8 and 31.8% respectively.¹²

Present study result is further supported by the fact that adult hypertension prevalence has risen dramatically over the past three decades from five per cent to between 20-40 per cent in urban areas.⁴

In the present study the prevalence of hypertension in rural area was estimated to be 25%, which was 14.96 % as estimated by a study conducted by Madhu B¹³ during 2010. Which is lower than the estimate from the present study. Present study results are comparable to the results from the study among rural residents of Tamil Nadu, Jharkand and Maharashtra which showed the prevalence of 26.2, 21.7 and 24% respectively.¹⁴

In the present study the prevalence of hypertension among urban population was found to be higher than the rural. The association of prevalence of hypertension with the area of residence was statistically significant (p=0.04).

Urban population tend to have higher prevalence of hypertension when compared to rural population. Gupta et al⁴ reported the highest prevalence of hypertension (48.2%) in a recent multi-centric study, conducted in the urban population of India. However, Chakraborty et al¹⁵ observed a lower prevalence of hypertension (17.6%) possibly be-

cause of the inclusion of younger age group (18-60 years).

From the available data and from the results from the present study it is obvious that the prevalence of hypertension in urban population is higher when compared to the rural population. But it can also be observed that the prevalence of hypertension in rural population is steadily increasing to match the urban rates.

The present study result of increased prevalence of hypertension with increasing age group is well corroborated by the results of many studies.^[6,16,17] This could be attributed to the accumulated effect of various risk factors as the age advances.

Various Studies have showed that increasing age, BMI, waist hip ratio, and impaired glucose tolerance/diabetes were independent risk factors for hypertension and prehypertension.^[18,19] Similarly in our study most of the individuals with prehypertension had one or the other risk factor such as extra salt intake, overweight, alcohol consumption, and others.

It is well-recognized that higher salt intake is associated with higher blood pressure and reduction in salt intake lowers blood pressure. Inter salt study²⁰ demonstrated that the reduction in the salt intake amounting to 100 mmol/day leads to reduction in SBP in the range from 1 to 6 mm Hg. For diastolic pressure, the estimated reduction is between 0.03 and 2.5 mm Hg. Various studies have demonstrated the efficacy of dietary approaches alone or along with other lifestyle modifications significantly reduce blood pressure both in hypertensive and pre-hypertensive.

In a study among North American population¹⁰⁰, it had been concluded that a consumption of >210 grams of ethanol/week is an independent risk factor for hypertension. Excess consumption was reported to account for 5-30% of all hypertension.²¹

In most of the studies, being overweight was associated with a twofold to six -fold increase in the risk of developing hypertension. For every 10% increase in weight a rise of 6.5 mm Hg in systolic pressure was observed in the Framingham study.²²

Limitations of the study

Firstly the study does not provide any inference regarding causal relationship of the variables with hypertension. Secondly various other factors such as biochemical markers like triglyceride, high-density lipoprotein, hyperuricemia are not evaluated which are known to influence hypertensive status. Thirdly, extrapolation of the prevalence of hypertension determined from this small sample size to entire rural population remains a query.

CONCLUSION

The prevalence of hypertension in urban area (31.4%) was higher than rural area (25%). The association of the prevalence of hypertension between urban and rural area was significant. Though prevalence of hypertension in rural area is low when compared to urban, it can be observed that it is increasing over time to match the urban rate. Present study emphasizes the fact that various risk factors are associated with the prevalence of hypertension and there is a significant association of these risk factors among hypertensive in urban and rural area.

REFERENCES:

1. World-heart-federation.org. Additional high blood pressure screening in developing countries would reduce the incidence of cardiovascular disease events and death by up to 3 per cent | World Heart Federation [Internet]. [cited 24 October 2015]. Available from: <http://www.world-heart-federation.org/congress-and-events/worldcongress-of-cardiology-scientific-sessions-2012/media-centre/pressreleases/detail/article/additional-high-blood-pressure-screening-in-developingcountries-would-reduce-the-incidence-of-cardi-1>
2. Deepa R, Shanthirani C, Pradeepa R, Mohan V. Is the rule of halves in hypertension still valid? Evidence from the Chennai Urban Population Study. *J Assoc Physicians India*. 2003;51(2):153--157.
3. Gupta R, Gupta S. Strategies for initial management of hypertension. *The Indian journal of medical research*. 2010;132(5):531.
4. Gupta R. Trends in hypertension epidemiology in India. *J Hum Hypertens* 2004; 18 : 73-8
5. Reddy KS, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. *Lancet* 2005; 366: 1744-9
6. Suwarna Madhukumar, Vaishali Gaikwad and Sudeepa D. An Epidemiological Study of Hypertension and Its Risk Factors in Rural Population of Bangalore Rural District. *Al Ameen J Med Sci*. 2012;5 (3):264-270
7. Reddy K. Regional case studies--India. Karger Publishers. 2009; 15-24.
8. Kulkarni A. Hypertension. A Silent Killer. *Indian Medical Gazette*. 1998;73-76.
9. Park K. Text book of Preventive and Social Medicine. 20th ed. Jabalpur: M. S. BanarsidasBhanot Publishers; 2011.
10. Kaur P, Rao S, Radhakrishnan E, Rajasekar D, Gupte M. Prevalence, awareness, treatment, control and risk factors for hypertension in a rural population in South India. *International journal of public health*. 2012;57(1):87--94
11. A Bhansali, V K Dhandania, M Deepa, R M Anjana, S R Joshi, P P Joshi, et al. Prevalence of and risk factors for hypertension in urban and rural India: the ICMR- INDIAB study. *Journal of Human Hypertension*. 31 July 2014
12. Raghupathy Anchala, Nanda K. Kannurib, Hira Pantb, Hassan Khana, Oscar H. Francoc, Emanuele Di Angelantonioa, and DorairajPrabhakaran. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *Journal of Hypertension*. 2014;32

13. Madhu B, Srinath KM, ASHOK NC. Hypertension: Prevalence and its associated factors in a rural south Indian population. *Indian journal of public health research and development*. 2012; vol 3, issue 4.
14. Gupta R, Pandey RM, Misra A, Agrawal A, Misra P, Dey S, Rao S, Menon VU, Kamalamma N, Vasantha Devi KP, Revathi K, Vikram NK, Sharma V, Gupta S. High prevalence and low awareness, treatment and control of hypertension in Asian Indian women. *J Hum Hypertens* 2012; 26: 585-593 [PMID: 21881598 DOI: 10.1038/jhh.2011.79]
15. Chakraborty R, Bose K, Koziel S. Waist circumference in determining obesity and hypertension among 18-60 years old Bengalee Hindu male slum dwellers in Eastern India. *Ann Hum Biol* 2011; 38: 669-675 [PMID: 21838593]
16. Rajesh Venkataraman, Satish Kumar Bp, M. Kumaraswamy, Rajveer Singh, Meenu Pandey, Priyank Tripathi. Smoking, Alcohol and Hypertension. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2013;5(4)
17. Sathya Prakash Manimunda, Attayuru Purushottaman Sugunan, Vivek Benegal, Nagalla Balakrishna, Mendu Vishnuvardhana Rao, Kasturi S. Pesala. Association of hypertension with risk factors & hypertension related behaviour among the aboriginal Nicobarese tribe living in Car Nicobar Island, India. *Indian J Med Res* 133, March 2011, pp 287-293
18. Robinson SC, Bruzer M. Range of normal blood pressure: A statistical and clinical study of 11,383 persons. *Arch Intern Med* 1939;64:409-44.
19. Prabhakaran D, Shah P, Chaturvedi V, Ramakrishnan L, Manhapra A, Reddy KS. Cardiovascular risk factor prevalence among men in a large industry of northern India. *Natl Med J India* 2005;18:59-65
20. Stamler J. The INTERSALT Study: Background, methods, findings, and implications. *Am J Nutr* 1997;62 6s-42s.
21. Fuchs FD, Chambless LE, Whelton PK, Nieto FJ, Heiss G. Alcohol consumption and the incidence of hypertension: The Atherosclerosis Risk in Communities Study. *Hypertension*. 2001; 37: 1242-1250
22. Garrison R, Kannel W, Strokes J III, Casteelli W. Incidence and precursors of hypertension in young adults. The Framingham offspring study. *American Journal of Preventive Medicine*. 1987; 16: 235-251.