



Prevalence of Hypertension and its Determinants in an Urban Area of Uttarakhand

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ABSTRACT

Hypertension is the most frequent cardiovascular disease and is assuming epidemic proportions in developing countries as well. It affects nearly 26.4% of the population worldwide. Prevalence of hypertension in India, for the last three decades has increased by about 30 times among urban residents and by about 10 times among rural residents. In this regard a study was conducted in an urban area namely Rishikesh of Dehradun district in between Dec. 2008 to May 2009. The purpose of this study was to know the prevalence of hypertension in Rishikesh and also to find out the associated risk factors with hypertension in this area. For this voter list was used as sampling frame and persons aged 30 years and above were shortlisted. A total of 327 volunteers were included in this study. A structured questionnaire was used to gather information about the prevalence of hypertension. Hypertension was defined as blood pressure more than 140/90 mm Hg. Prevalence of hypertension was presented in percentage, and association of risk factors was done by using Chi square test. A p value < 0.05 have been considered statistically significant. The overall prevalence of hypertension in Rishikesh was 38.5%. Age, educational status, economic-status, physical activity, alcohol consumption and body mass index were found significantly associated with hypertension. Thus, both prevalence and risk factor studies are needed to estimate the prevalence of hypertension as well as get at specific risk factors for Indian Population. Such studies will help in setting the baseline by which the risk factor can be ranked and specific control strategies planned to promote health of the middle age and elderly population.

1. INTRODUCTION:

Hypertension is the most frequent cardiovascular disease and is assuming epidemic proportions in developing countries as well¹. Overall 26.4% of the world's population in the year 2000 had hypertension and it is expected that by the year 2025, approximately 1 in 3 adults aged above 20 years will have the disease². Hypertension is an iceberg disease and can be described as the sleeping snake which bites when it wakes up. Prevalence of hypertension is increasing in developing countries very rapidly and is said to be one of the most leading cause of mortality and morbidity among the elderly³. Prevalence of hypertension in India, for the last three decades has increased by about 30 times among urban residents and by about 10 times among rural residents¹. Several risk factors have been

implicated in the aetiology of hypertension. This includes geographic considerations, genetic, socio-economic, socio-cultural, dietary, and nutritional status etc⁴. While the risk factors and their impact on hypertension is documented by well designed studies in the Western countries, systematically conducted studies using rigorous epidemiological techniques are lacking in India. Epidemiological studies to assess the prevalence of hypertension are urgently needed in developing countries like India to determine the baseline against which future trends in various risk factors can be assessed and preventive measures planned to promote health. Uttarakhand is a newly formed and one of the hilly states of India. Lifestyle of residents of this state is different from

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other parts of India and few studies on prevalence of hypertension are available from this state and most of these studies are hospital based. Thus with the attention of getting prevalence of hypertension and its associated risk factors in an urban area, the department of Zoology, Govt. post graduate college, Rishikesh did a cross sectional survey in Rishikesh city of district Dehradun, Uttarakhand.

2. MATERIALS AND METHODS

2.1 Study population and sampling frame

A cross sectional study was carried out among the adults in the age group of 30 years and above residing Rishikesh city of Dehradun district. According to 2001 census⁵, Rishikesh had a population of 59,671. Males constitute 56% of the population and females 44%. A total of 33723 persons were found aged 30 years and above and 1% population of this area was studied. Voter list was used as sampling frame. A list of persons aged 30 years and above was prepared then all persons living in the study site were compiled and each participant was assigned their code number separately. Simple random method (lottery) was employed for the selection of the study participants in the study site. With the help of ward members study participants were informed by the oral communication regarding the aims and objectives of the present study. Written and verbal consent has been taken from each of the study participants. After selection of study participants' door to door survey has been done. The duration of present study was between Dec.2008 to May 2009.

2.2 Data collection tools

All the volunteers had administered the pretested questionnaire. The following information were collected from each subject: age, gender, height, weight, education, occupation, income, diet, family history of hypertension, smoking habits, alcohol consumption, stress and physical activity. After verifying the questionnaire, blood pressure has been measured for each participant. For blood pressure measurements a 2 days formal training have been taken in Nirmal Asram Hospital, Rishikesh under the supervision of cardiologist. Blood pressure was measured for each participant, using the auscultatory method with a standardized calibrated mercury column type sphygmomanometer (Elite Surgical Industries, Delhi) and an appropriate sized cuff encircling at least 80% of the arm in the seated posture, with feet on the floor and arm supported at heart level. Following standardized protocol, we made two separate measurements and recorded the average of the two measurements after rest and due explanation about the objective of the study. Systolic BP is the point at which two or more sounds is heard (Phase 1) and diastolic pressure is the point before the disappearance of sounds (Phase 5). Blood pressure was graded as normal (SBP <120 and DBP <80 mmHg), 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 > 160 and/or DBP > 100mmHg) as per US Seventh Joint National Committee on Detection, Evaluation and Treatment of Hypertension (JNC VII) criteria⁶. Hypertension was diagnosed when systolic BP was ≥ 140 mmHg and/or mean diastolic BP ≥ 90 mmHg or when a person had history of anti hypertensive treatment fifteen days before the survey. Body mass index⁷ was calculated as weight in kilograms / height in meter². Dietary data were categorized according the type of food the person eats (vegetarian or mixed). Data on smoking habit were collected as smokers who smoke currently and non smokers who never smoked. Alcohol consumption was stratified as alcoholic who consumes alcohol currently and non alcoholic who never consumed alcohol. Socioeconomic status was categorized based on the earlier published study⁸. Physical activity was assessed by inquiring study persons about work and spare time activities.

2.3 Statistical analysis

The collected data were analyzed on SPSS software version 16.0. The prevalence of hypertension was presented as percentage. The association between categorical variables and hypertension were tested using Chi square test. A p value of < 0.05 was considered statistically significant.

3. RESULTS

Total 337 persons were included in the study. Of them 10 (3.0%) persons fail to continue in the study. So the results of only 327 persons have been analyzed. The overall prevalence of hypertension was 38.5%. Age specific prevalence of hypertension showed that prevalence of hypertension increases with increasing age. A sharp increase in hypertension prevalence was found in fourth decade of life. Early onset of hypertension may be as a result of leading a stressful and fast urban lifestyle, without sufficient rest to mind and body (**Table-1**). Sex-wise distribution of participants suggests that higher prevalence of hypertension was found in females than males i.e. 39.3 % vs. 37.5%, but the difference was not found to be statistically significant. Prevalence of hypertension among alcoholic was higher than those who do not consume alcohol i.e. 47.9% vs. 33.7%. Alcohol consumption was significantly associated with prevalence of hypertension ($p = 0.008$) (**Table-3**). As per physical activity prevalence of hypertension was found high among sedentary persons as compared to physically active persons i.e. 41.3% vs. 36.5% respectively. Physical activity was significantly associated with prevalence of hypertension ($p = 0.046$) (**Table-4**). According to BMI, the sample size of 327 volunteers was categorized as normal, overweight and obese, and 186 (56.9%), 95(29.0%) and 46

(14.1%) were found in each category respectively. The prevalence of hypertension was highest among obese (65.2%) compared to overweight (49.5%) and normal (26.3%) respectively. The prevalence was high statistically significant (p 0.000) (Table-4). All other factors studied were not found to be statistically significant among study subjects. Those factors were gender, smoking, dietary habits, family history, stress, occupation, economic status (p > 0.05).

Age in years	Total Population	Normal	Pre-hypertensive	Stage I HTN	Stage II HTN
30-39	61 (18.7)	19 (31.1)	35 (57.4)	5 (8.2)	2 (3.3)
40-49	85 (26.0)	20 (23.5)	37 (43.5)	16 (18.8)	12 (14.1)
50-59	77 (23.5)	15 (19.5)	25 (32.5)	19 (24.7)	18 (23.4)
60-69	53 (16.2)	11 (20.8)	14 (26.4)	15 (28.3)	13 (24.5)
>=70	51 (15.6)	9 (17.6)	16 (31.4)	12 (23.5)	14 (27.5)

Chi Square (χ^2) = 32.616, df = 12, p value = 0.000

Table-1 Prevalence of hypertension according to age among study subjects

Alcohol consumption	Total Population	Normal	Pre-hypertensive	Stage I HTN	Stage II HTN
Alcoholic	68 (20.2)	9 (13.0)	20 (29.0)	27 (39.1)	13 (18.8)
Non-alcoholic	259 (79.8)	64 (24.8)	107 (41.5)	41 (15.9)	46 (17.8)

Chi Square (χ^2) = 18.563, df = 3, p value = 0.008

Table-2 Prevalence of hypertension as per alcohol consumption among study subjects

Physical Activity	Total Population	Normal	Pre-hypertensive	Stage I HTN	Stage II HTN
Active	169 (51.8)	51 (27.0)	69 (36.5)	41 (21.7)	28 (14.8)
Sedentary	138 (42.2)	23 (16.7)	58 (42.0)	26 (18.8)	31 (22.5)

Chi Square (χ^2) = 7.281, df = 3, p value = 0.046

Table-3 Prevalence of hypertension as per physical activity status among study subjects

Body mass index	Total Population	Normal	Pre-hypertensive	Stage I HTN	Stage II HTN
Normal	186 (56.9)	51 (27.4)	86 (46.2)	24 (12.9)	25 (13.4)
Overweight	95 (29.0)	19 (20.0)	29 (30.5)	24 (25.3)	23 (24.2)
Obese	46 (14.1)	4 (8.7)	12 (26.1)	19 (41.3)	11 (23.9)

Chi Square (χ^2) = 33.4332, df = 6, p value = 0.000

Table-4 Prevalence of hypertension as per Body mass index among study subjects

4. DISCUSSION

The prevalence of hypertension is on increase in developed nations as well as in developing countries. In context to India, the average prevalence of hypertension in India is 25% among urban dwellers and 10% in rural inhabitants¹. Factors responsible for these changes are rapid urbanization, lifestyle changes, dietary changes, stress and increased life expectancy⁴. The overall prevalence of hypertension was found to be 38.5% in the present study. Present study prevalence rate among adults were comparable to some other Indian studies. Study by Gupta R and co-workerse⁹, in Jaipur among adults in the age group 20-75 years have shown the prevalence of hypertension was 37.0%. Banerji Monali¹⁰ et al, (41.4%) in Orissa, Prakash R¹¹ (43.5%) in Udaipur, by Gupta MM¹² et al, (43.3%) in Rewa MP, the Mumbai study by Gupta PC¹³ (~44%) and the study done in Trivendrum by Joseph A¹⁴ (~36%).

The prevalence rate in our study was less when compared to the Meerut study done by Maroof KA¹⁵ et al, (57.3%), the Thiruvananthpuram study by Kalavathy MC¹⁶ et al, (51.8%).

The prevalence in our study was high when compared to other studies done by Anand MP¹⁷ (~27%) among executives of Mumbai, Meshram FC¹⁸ et al, (~22.5%) among police personnel of Nagpur, Mohan V¹⁹ et al, (~22%) among Chennai urban population and another study by the Deepa R²⁰ et al, (14%) in Chennai among adults in the age group 20-60 years. Similar rates were found in other studies in US (28%) and Canada (22%). Higher prevalence was found in studies conducted in developed countries, Germany 55%, Finland 49%, Spain 47%, England 42%, Sweden 38% and Italy 38% (Wolf M et al., 2003).

4.1 Prevalence of hypertension according to age and gender

In the present study, the prevalence of hypertension was found to increase steadily with age. A sharp increase in hypertension prevalence was observed in the fourth decade among study subjects. Early onset of hypertension in urban population may be as a result of leading a stressful and fast urban lifestyle, without sufficient rest to mind and body. Even though most age groups among the urban population showed a higher susceptible developing hypertension. Several studies have consistently demonstrated a positive relation between age and blood pressure. Study done in Delhi and adjoining rural area of Haryana by Chadha SL²² et al, showed prevalence to be 4.1% (males) and 2.84% (females) in the age group 25-34 years which increased to 22.9% (males) and 32.9% (females) in the age group 55-64 years. The Jaipur urban study by Gupta R⁹ et al, reported a prevalence of 15.4%

amongst <40 years age group, 34.7% between 40-49 years and 58% in the age group \geq 50 years.

Increase prevalence with age is well documented, and this could be attributed to the accumulated effects of various risk factors.

The present study did not reveal any difference in the prevalence of hypertension between males and females 39.3 % and 37.5% respectively. Our findings were comparable to the studies by Kumar and Chaudhary in West Rajasthan²³, Hussain SA²⁴ et al, in North West Rajasthan, Anand MP¹⁷ in Mumbai and Zachariah²⁵ et al, in the urban population in Kerala, who found no difference in the prevalence between males and females.

Studies by Jajjo UN²⁶ et al, in Sewagram, Malhotra P²⁷ et al, in North India and Joseph A¹⁴ et al, in Trivandrum showed the prevalence in females to be higher than males.

4.2 Prevalence of hypertension according to physical activity and alcohol consumption

Our study shows that 41.3% urban hypertensive's led a sedentary life style among all study subjects. Sedentary life style among urban population show significant association with hypertension. It has been seen that sedentary individuals have 20-50% increased risk of developing hypertension revealed by the study of Blair²⁸ et al.

In a National CSI¹⁷ study, 78% of hypertensive's had a sedentary lifestyle compared to 45% of controls. Higher prevalence of sedentary lifestyle among the urban hypertensives could be due to the fact that they work in advanced infrastructural steps, which involve more intellectual but less physical work.

In the present study, prevalence of hypertension was found high among alcoholics 47.9% than non alcoholic subjects which are 36.5%. The difference between the two groups was found statistically significant. However potential mechanisms for the relationship include a direct pressor effect of alcohol on the vessel wall, a sensitization of resistance vessels to pressor substances, stimulation of the sympathetic nervous system and increased production of adrenocorticoid hormones²⁹. However the Chennai urban population study found no association between hypertension prevalence and alcohol consumption.

4.3 Prevalence of hypertension according to Body mass index

In our study, it was found that 65.2% urban hypertensives had a BMI above 29.9 kg/m². Framingham study³¹ showed that for every 10% increase in weight there was a rise of 6.5 mm Hg in systolic blood pressure. The Jaipur urban⁹ (both sexes) and rural studies³² (only males), Haryana rural study²⁷, the Chennai urban population study³⁰ as well as Bombay executive study²⁰, study by Bansal SK³³ have all

shown a higher weight and BMI amongst hypertensive groups.

Increase in age, alcohol consumption, physical activity and body mass index were found to be significantly associated with prevalence of hypertension. Except age all were modifiable risk factors, so it is necessity for the health care providers to take note of this trend and plan appropriate preventive measures, including changing lifestyle modification.

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6. REFERENCES

1. Gupta R. Rethinking Diseases of Affluence; Coronary Heart Disease in Developing Countries. *South Asian Journal of Preventive Cardiology* 2006; 10(2): 65-78 and 2004 8(1&2): 5-6.
2. Kearney PM, Whelton M, He J. Global Burden of Hypertension: analysis of worldwide Data. *Lancet* 2005; 365:217-23.
3. Murray C L J, Lopez A D: Global Health statistics: Global burden of diseases and injury series. *Harvard school of Public Health: Boston* 1996; 349:1436-42.
4. Pradeepa R, Mohan V. Hypertension and pre-hypertension in developing countries. *Indian J. Med. Res.* 2008; 128:688-690.
5. Census of India 2001: Data from the 2001 census including cities, villages and towns(provisional). *Census commission of India*. Archived from the original on 2004-06-16. Retrieved 2008-11-01.
6. Chobanian AV, Bakris GL, Black HR. 2003. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure- *The JNC7report. JAMA.* 289:2560-2572.
7. Park K. 2007. Park's Textbook of preventive and social medicine 19th Edition: M/S Banarasisdas Bhanot publishers, Jabalpur 482001.
8. Hamzullah Khan MR, Hafizullah Mohammad. 2006(3). Morbidity data on Hypertension. *Professional Med. J.* 13(1): 68-779
9. Gupta R, Gupta S, Gupta P, Prakash H. (1995). Prevalence and determinants of hypertension in the urban population of Jaipur in western India. *J. Hypertens.* 13: 1193-1200.
10. Banarji Monali, Kusuma YS and Das PK. (2003). Prevalence of hypertension among an urban population of Bhuvneshwar city, Orissa, India. *J. Hum. Ecol.* 14(5): 377-381.
11. Prakash R, Chaudhary SK, Singh US. (2004). A study of morbidity pattern among geriatric population in an urban area of Udaipur Rajasthan. *Indian J. of Community Medicine.* 29(1): 35-40.
12. Gupta MM, Patil RK, Khan MI, Gupta SK. (2012). Effect of lifestyle risk factors on prevalence of hypertension in a defined urban population of Rewa. *Natl. J. Comm. Med.* 3(4): 570-575.
13. Gupta PC and Gupta R. (1999). Hypertension prevalence and blood pressure trends, among 99,589 subjects in Mumbai, India. *Abstract. Indian Heart Journal.* 51: 691.
14. Joseph A, Kuttly VR, Soman CR, High risk for coronary heart disease in Thiruvananthapuram city: a study of serum lipids and other risk factors. *India Heart J.* 2000; 51: 29-35.
15. Maroof KA, Parashar P, Bansal R, Anand S. (2007). A study on hypertension among the bank employees of Meerut district of Uttar Pradesh. *Indian Journal of Public Health.* 51(4): 225-227.
16. MC Kalavathy, Thankappan KR, Sharma PS, and Vasan RS. (2000). Prevalence, awareness, treatment and control of hypertension in an

- elderly community based sample in Kerala India. The National Medical Journal of India. 13: 9-15.
17. Anand MP. (2000). Prevalence and grades of hypertension amongst executives of Mumbai. Journal of Assoc. of Physic. India. 48(12): 1200-1201.
18. Meshram FC, Narlawar U, Durge PM. (2005). High prevalence of hypertension among police personnel at Nagpur. South Asian Journal of Preventive Cardiology. 9(2): 98-106.
19. Mohan V, Deepa R, Rani S S, Premlatha G. Prevalence of CAD and relationship to lipids in a selected population in South India. J. Am. Coll. Cardiol. 2001; 38: 682-687.
20. Deepa R, Santirani CS, Pradeepa R, Mohan V. (2003). Is the rule of halves in hypertension still valid? Evidence from the Chennai urban population study. J.Assoc. Pys. India. 51: 153-157.
21. Wolf Maier K, Cooper RS, Banegas JR et al. (2003). Hypertension prevalence and blood pressure level in 6 European countries, Canada and the intied states. JAMA. 289: 2363-2369.
22. Chadha SL, Radhakrishnan S, Ramachandran K, Kaul L and Gopinath N. (1990). Prevalence, awareness and treatment of hypertension in urban population of Delhi. Ind. J. Med. Res. 92: 233-240.
23. Kumar P and Chaudhary V. (1991). Epidemiology study of hypertension in western Rajasthan. Ind.Heart J. 43:43-45.
24. Hussain SA, Nayak KC, Gupta A. (1988). A study of prevalence of hypertension with reference to economic, educational, environmental and hereditary factors in general population of North West Rajasthan. India Heart J. 40(3): 148-151.
25. Zakhariah MG, Thankappan KR, Shiney CA, Sarma PS and Vasam RS. (2003). Prevalence, correlates, awareness, treatment and control of hypertension in a middle aged urban population of Kerala. Indian Heart Journal. 55: 245-251.
26. Jajjo UN, Kalantri SP, Gupta OP et al. (1993). The prevalence of hypertension in rural population around Sewagram. J.Assoc. Phys.Ind. 41(7): 422-424.
27. Malhotra P, Kumari S, Kumar R et al. (1999). Prevalence and determinants of hypertension in an un-industrialized rural population of north India. J. Hum. Hypertens. 13(7): 467-472.
28. Blair SN, Goodyear NN, Gibbons LW, Cooper KH. (1984). Physical fitness and incidence of hypertension in healthy normotensive men and women. Journal of American Med. Assoc. 252: 487-490.
29. Anand MP. (1995). Epidemiology of hypertension. Current concepts in Hypertension. Sai Rani GS (Ed). ICP Mumbai. P4-13.
30. Shantirani CS, Pradeepa R, Deepa R, Premlatha G, Saroja R, Mohan V. (2003). Prevalence and risk factors of hypertension in a selected south Indian population the Chennai urban population study. JAPI. 51: 20-27.
31. Garrison R, Kannel W, Strokes J III Castellio. (1987). Prevalence and precursors of hypertension in young adults. Framingham offspring study. American Journal of preventive Medicine. 16: 235-251.
32. Gupta R and Sharma AK. (1994). Prevalence of hypertension and subtypes in an Indian rural population: clinical and electrocardiographic correlates. J. Hum. Hypertension. 8:823-829.
33. Bansal SK, Saxena V, Kandpal SD, Grey WK, Walker RW and Goel D. (2012). Prevalence of hypertension and hypertension risk factors in a rural Indian community: A prospective door to door study. Journal of Cardiovascular Disease Research. 3(2): 117-123.

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