

Hypertension and its Associated Risk Factors Detected through Portable Mobile Lab at PHC, Najafgarh, Delhi

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Abstract

Introduction: Hypertension (HTN) is a major risk factor for cardiovascular disorders and stroke, which are the leading cause of mortality in India. Its detection is necessary to prevent complications particularly in rural and remote areas. Due to shortage of professional human resources, alternative methods are needed.

Objectives: To detect prevalence of hypertension and its associated risk factors in the rural population of Delhi through an innovative and cost-effective portable mobile lab.

Materials and Methods: It was a cross-sectional study conducted at the Rural Health Training Centre (RHTC) Najafgarh, Delhi among 500 adult subjects aged 18 years and above who were attending the outpatient department (OPD). WHO STEPS approach was used to collect data. Lipid profile and blood sugar was measured along with BP and BMI. Data analysis was done using SPSS version 16. p-value less than 0.05 was considered as significant.

Results: The prevalence rate of hypertension was 20.2% among study subjects. Hypertension was significantly higher in individuals more than 55 years than those less than 55 years. Hypertension was higher in those who were physically inactive, smokers, alcohol & tobacco users in comparison of non-users. Subjects with hypertension had significantly raised level of triglyceride, total cholesterol and blood sugar.

Conclusion: Portable mobile lab was useful tool to detect hypertension and its risk factors. Prevalence of Hypertension was high in rural areas in Delhi. Age, high blood sugar, triglycerides and cholesterol levels were significantly associated with hypertension.

Keywords: Hypertension, Mobile Lab, Rural Health Training Centre

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Introduction

Hypertension, the world's leading risk factor for global disease burden, is expected to cause more than half of the estimated 17 million deaths per year resulting from cardiovascular disease (CVD) worldwide.¹ HTN is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India.² The presence of other risk factors such as hyperlipidaemia, cigarette smoking, diabetes, and elevated age can greatly increase the risks associated with even mild hypertension.³

In addition, knowledge of a patient's lifelong exposure to elevated blood pressure may help further refine cardiovascular risk assessment.^{4,5} Defined as an elevation of systolic blood pressure (BP) beyond 140 mm Hg and diastolic more than 90 mm Hg, hypertension is strongly correlated with adverse outcomes such as stroke, ischemic heart disease, heart failure, and end stage renal disease. Although the condition is common, readily detectable, and easily treatable, it is usually asymptomatic and often leads to lethal complications if left untreated.⁶ According to Global Burden of Disease Hypertension is the 4th contributor to premature death in developed countries and the 7th in the developing countries⁷ with the overall prevalence of 26.4% among the adult population in 2000.⁸

Escalating cardiovascular risk factors such as smoking, high blood pressure (BP), high low density lipoprotein (LDL) cholesterol, low high density lipoprotein (HDL) cholesterol, metabolic syndrome and diabetes are the major risk factors associated with the increasing CVD in India.⁹ Many low- and middle-income countries, most of which are in the midst of the epidemiological transition, face rapidly increasing prevalence of hypertension in the context of limited healthcare resources.¹⁰ Thus, in these countries developing innovative and cost-effective solutions to improve hypertension diagnosis as well as management and control remains a key priority.¹¹

India, being a culturally and socially diverse nation, differences would be noted in the region-wise prevalence of hypertension, but research regarding the same is inadequate in the rural areas of Delhi. This inadequacy necessitated us to conduct this study with the objective of assessing the prevalence rate of hypertension and its associated risk factors including the socio-demographic correlates of hypertension using innovative and cost-effective technique.

Materials and Methods

A cross-sectional study was conducted for 1 year among individuals of either sex, aged 18 years and above. The study was carried out at the primary health centre, Najafgarh, Delhi in the rural field practice area of the Department of

Community Medicine, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi.

Study Design and Sample Size

Inclusion criteria

All the adult population (age >18years) attending the outpatient department, who were advised tests by the doctors and willing to participate in the study.

Exclusion criteria

The patients below 18 years of age, pregnant females and those who were not willing to participate in the study.

The sample size was calculated on the basis of previous study which recorded prevalence of hypertension on in rural populations 14% for rural population in Delhi, with an allow able error of 10%.¹² Taking 95% confidence limit the sample size estimated was 384, however 500 individuals aged 18 years and above were included in the study.

Study Tool and Data collection

A predesigned, pretested and semi-structured questionnaire was used by the surveyor to assess the socio-demographic profile like age, sex, religion, profession, educational status and so forth. Information on behavioural risk factors like tobacco use, alcohol use and related factors were collected. The clinical measurements such as weight, height and blood pressure were obtained using standardized protocols and instruments. WHO STEPS approach was employed to study the profile of the hypertension in the population. The questionnaire was translated into the regional vernaculars and back translated into English. The questionnaire items and format were pilot-tested for clarity and face validity; all questions were reviewed by the investigator experienced in conducting community-based surveys.

Measurement of blood pressure and anthropometry

Mobile lab has various components such as blood pressure, anthropometry, blood and serum investigation and urine analysis. Two measurements of blood pressure were made on each participant with a dial sphygmomanometer using a standardized technique.¹³ The first blood pressure measurement was recorded after obtaining socio-demographic information from the study subject, while the second was recorded after a brief clinical examination. All blood pressure measurements were made on the left arm of each study subject, using a cuff of appropriate size at the level of the heart. The cuff pressure was inflated 30 mm Hg above the level at which the radial pulse disappeared, then deflated slowly at the rate of about 2 mm per sec. The average of two readings of SBP

and DBP was used to describe the blood pressure of the participant. In cases where the two readings differed by over 10 mm of Hg, the surveyor obtained a third reading, and the three measurements were averaged. Body weight was measured (to the nearest 0.5 kg) with the subject standing motionless on the weighing scale, feet about 15 cm apart, and weight equally distributed on each leg. The participants were instructed to wear minimum outerwear and no footwear while their weight was being measured. Height was measured (to the nearest 0.5 cm) with the subject in an erect position against a vertical surface. Body mass index (BMI) was calculated using the formula of weight (kg)/height (m²). A person was considered to be obese if body mass index ≥ 30 kg/m² and overweight when BMI ≥ 25 kg/m.^{2,14}

Hypertensive subjects were defined as those with systolic blood pressure (SBP) equal to or more than 140 mm Hg and or diastolic blood pressure (DBP) equal to or more than 90 mm Hg or those being treated for hypertension.

For biochemical estimation 5ml of blood was taken from the patients and were estimated for blood sugar level and lipid profile (total cholesterol, triglycerides, high-density lipoprotein). These estimations were done through validated mobile lab using semi-automated analyser. This lab is a portable compact mobile lab in a suitcase and can be used in the rural and remote areas. The validation of this mobile lab has been done through the ICMR project.¹⁵

Ethical Issues

Institutional ethical clearance was obtained prior to initiation of the study. Each selected subject had been explained about the purpose and procedure of the study by the investigator and an informed written consent was obtained. Referral services were provided if required to the higher centre. The prior ethical clearance for the study was also obtained from the institutional ethics committee.

Statistical Analysis

All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 16. Prevalence and risk factors of hypertension are presented as percentages. The association between hypertension and socio-demographic variables, diabetes, obesity, physical activity, was assessed by comparing the prevalence of hypertension in individuals with and without these risk factors. The chi-square test was used to analyse the differences. p value less than 0.05 was considered as significant.

Results

Characteristics of the Sample

The characteristics of the study subjects are shown in Table

1. The study included 500 subjects of which 193 (38.6%) were males and 307 (61.4 %) were females. Of the total study subjects, 92.8% were Hindus, 6.4% were Muslims, and 0.8% were Christians. The proportion of literate was 77.2%. Unemployment among the study subject was 21.4%.

Table 1. characteristics of the study subjects (n=500)

Characteristic	Participants n (%)
Gender	
Male	193 (38.6)
Female	307 (61.4)
Age	
18-35 years	187 (37.4)
36-55 years	199 (39.8)
56 & above	114 (22.8)
Religion	
Hindu	464 (92.8)
Muslim	32 (6.4)
Christian	4 (0.8)
Marital Status	
Married	430 (86)
Unmarried	61 (12.2)
Widow	9 (1.8)
Education	
Illiterate	114 (22.8)
Literate	386 (77.2)
Profession categories	
Professional	15 (3)
Semi-professional	17 (3.4)
Clerk/shop owner/ farm owner	5 (1)
Skilled	27 (5.4)
Semiskilled	57 (11.4)
Unskilled	66 (13.2)
Unemployed	313 (62.6)
Income categories	
Rs.0-5000	77 (15.4)
Rs.5001-10000	237 (47.4)
Rs.10001 & above	186 (37.2)

Prevalence of Hypertension

The prevalence rate of hypertension was (n=101/500) 20.2% of which, a higher prevalence was noted among males (n=41/193) 21.2% as compared to females (n=60/307) 19.5%. Table2, shows the socio-demographic characteristics vs hypertensive & non-hypertensive subjects. The hypertension was significantly higher in individuals more

than 56 years than those who were less than 56 years of age ($\chi^2=40.6, 0.001$). There was a significant difference in proportion of hypertension in different groups based on monthly per capita income with highest prevalence in category of Rs.5001-10000 ($\chi^2=6.07, 0.04$). There was no significant difference in prevalence of hypertension in different education classes and professional categories.

Table 3 shows modifiable risk factors of hypertension among the study subjects. It can be seen that there was no significant difference in prevalence of hypertension

among smokers, tobacco and alcohol users than in the non-users. Out of 101 hypertensive subjects, 36 (26.9%) subjects were overweight and 20 (18.5%) were obese, although there were no significant differences related to BMI categories. Among those who have raised cholesterol levels, 25.9% were found to be hypertensive ($\chi^2=3.77, p=0.05$). Similarly, those who have abnormal TG, 27% of them have hypertension ($\chi^2=11.5, p=0.001$). Those who have raised blood sugar level, 36.7% of them were found to be having hypertensive ($\chi^2=12.1, p=0.001$).

Table 2. Sociodemographic profile vs hypertensive & non-hypertensive subjects (n=500)

Variables	Groups		Total	χ^2, p value	
	Hypertensive n (%)	Non-hypertensive n (%)			
Gender					
Male	41 (21.2)	152 (78.8)	193	0.212, 0.645	
Female	60 (19.5)	247 (8.5)	307		
Age					
18-35 years	17 (9.1)	170 (90.9)	187	40.6, 0.001	
36-55 years	39 (19.6)	160 (80.4)	199		
56 & above	45 (39.5)	69 (60.5)	114		
Religion					
Hindu	95 (20.5)	369 (79.5)	464	1.07, 0.58	
Muslim	6 (18.8)	26 (81.2)	32		
Christian	0 (0)	4 (100)	4		
Marital Status					
Married	92 (21.4)	338 (78.6)	430	5.40, 0.06	
Unmarried	6 (9.8)	55 (90.2)	61		
Widow	3 (33.3)	6 (66.7)	9		
Education					
Illiterate	28 (24.6)	86 (75.4)	114	1.74, 0.187	
Literate	73 (18.9)	313 (81.1)	386		
Profession categories					
Professional	1 (7.1)	14 (93.3)	15	3.71, 0.812	
Semi-professional	3 (17.6)	14 (82.4)	17		
Clerk/shop owner/farm owner	0 (0)	5 (100)	5		
Skilled	6 (22.2)	21 (77.8)	27		
Semiskilled	10 (17.5)	47 (82.5)	57		
Unskilled	14 (21.2)	52 (78.8)	66		
Unemployed	67 (21.4)	246 (78.6)	313		
Income categories					
Rs.0-5000	17 (22.1)	60 (77.9)	77		6.07, 0.04
Rs.5001-10000	57 (24.1)	180 (75.9)	237		
Rs.10001& above	27 (14.5)	159 (85.5)	186		

Table 3. Modifiable risk factors of hypertension in the study subjects

Variables	Groups		Total	χ^2 , p value
	Hypertensive n (%)	Non-hypertensive n (%)		
Smokers				
Yes	11 (22.4)	38 (77.6)	49	0.170, 0.680
No	90 (20)	361 (80)	451	
Tobacco user				
Yes	5 (23.8)	16 (76.2)	21	0.177, 0.674
No	96 (20)	383 (80)	479	
Alcohol user				
Yes	4 (13.3)	26 (86.7)	30	0.897, 0.344
No	95 (20.5)	369 (79.5)	464	
Physical activity				
Yes	63 (19.3)	264 (80)	327	4.31, 0.116
No	38 (22)	135 (78.5)	173	
BMI				
Underweight	6 (10.7)	50 (89.3)	56	7.10, 0.69
Normal	39 (19.3)	163 (80.7)	202	
Overweight	36 (26.9)	98 (73.1)	134	
Obese	20 (18.5)	88 (81.5)	108	
HDL				
Normal	56 (21.8)	201 (78.2)	257	0.670, 0.413
Decreased	45 (18.8)	194 (81.2)	239	
LDL				
Normal	71 (20)	277 (79.6)	348	0.004, 0.947
Abnormal	29 (20.1)	115 (79.9)	144	
Triglycerides				
Normal	43 (14.5)	254 (85.5)	297	11.5, 0.001
Raised	51 (27)	138 (73)	189	
Cholesterol				
Normal	65 (18.1)	295 (81.9)	360	3.77, 0.052
Abnormal	35 (25.9)	100 (74.1)	135	
Blood Sugar (R)				
Normal	74 (17.5)	349 (82.5)	423	12.1, 0.001
Raised	22 (36.7)	38 (63.3)	60	

Discussion

The World Health Report 2002 identified high blood pressure (BP) as one of the five important risk factors for non-communicable diseases worldwide. It is estimated that elevated BP alone causes about 50% of cardiovascular disease (CVD) worldwide. The prevalence of hypertension has increased during the last decade.¹⁶ The high prevalence of hypertension (20.2.9%) in this study, confirms this increasing trend. In Central India the overall prevalence of hypertension is 19.04%, with 23.4% males and 14.4 %

in females¹⁷ whereas, in Kerala it was reported 36.7% with 36 % in males and 37.2 % in females.

The prospective observational cohort studies as well as cross-sectional surveys, have consistently demonstrated a positive relation between age and blood pressure in most populations with diverse geographical, cultural and socioeconomic characteristics. Such changes of blood pressure with age might be due to changes in vascular system.¹⁹ In our study, only 135 subjects (27%) were overweight and 108 (21.6%) were obese as per BMI (>25).

The prevalence of HTN in obese subjects with BMI was 18.5%. Similar findings were observed in the studies of Vimala A et al. and Rodger RA et al. who had reported a significant association between HTN and BMI.^{21,22}

The prevalence of hypertension was also found to be consistently increased with increasing age as revealed by other authors. Vasan RS et al. in their study conducted among 1298 subjects found significant association of hypertension with age.²³

Prevalence of hypertension was higher in tobacco users and alcoholics in our study. These two are already independent risk factors as mentioned in many studies. Alcohol has been reported as an independent risk factor by other authors as well.²³ Similarly, hypertension was more prevalent among those with raised cholesterol and triglycerides levels. Similar results were shown by other studies also previously.²⁴

In this study we inferred that 36.7% of the hypertensive's suffered from type 2 diabetes mellitus. The prevalence of coexistent of hypertension and diabetes varies across different ethnic, racial, and social groups. Importantly, hypertension in patients with type 2 diabetes causes a significant increase in the risk of vascular complications in this population, and together both conditions predispose to chronic kidney disease.^{25,26}

Conclusion and Recommendations

High prevalence of hypertension increases the load in term of morbidity and also put immense economic burden on already stressed Indian economy. Many known risk factors were studied but blood sugar and triglyceride were associated significantly in hypertensive patients. It is recommended that people should focus on decreasing of blood sugar and triglyceride would be beneficial. It is also found out that mobile laboratory can be used in remote areas to assess the non-communicable disease and risk factors.

Conflict of Interest: None

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