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Assessment of the prevalence of Hypertension and its association with various risk factors in the rural population of the district Muzaffarnagar

Sangeeta Jain Sharma[1], Lubna Zarin[2], Umer Farooq[3], Dheeraj Sharma[4], Santosh Raghav[5]

[1,2,3,4]Assistant Professor, [5]Statistician cum Lecturer, Dept. of Community Medicine,
Muzaffarnagar Medical College, Muzaffarnagar U.P.

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Abstract

Background: We are living in a rapidly changing environment. One of the most striking examples of this shift is the fact that NCDs such as Hypertension, Cardiovascular diseases, Cancer, Diabetes and Chronic Lung diseases have overtaken infectious diseases as the world's leading cause of morbidity and mortality. Hence, it is important to know the blood pressure status before target organ damage occurs.

Aim and objectives: This study was designed to Assess the prevalence of Hypertension and its association with various risk factors in the rural population of the district Muzaffarnagar.

Material and Methods: Community based, Cross-sectional study. Simple random Sampling was done to have the sample size of 660.Semistuctured, pretested questionnaire and different measurement tools were used to collect the data.

Result: Shows that the prevalence of Hypertension was observed to be 18.9 % (stage i+ stage ii), out of which 13.3 % were in stage i Hypertension and 5.6% were in stage ii Hypertension. Pre-hypertensive constituted 40.2% while 40.9% of study subjects were Normotensive.

Conclusion: There was a significant impact of the risk factors on the prevalence of hypertension and different preventive measures should be advised to prevent and control the epidemic of hypertension.

Keywords: Hypertension, BMI,Central obesity, salt intake

Introduction

Hypertension is an iceberg disease and can be described as the sleeping epidemic which will create havoc when it wakes up. HTN is the third leading killer in the world and responsible for one in every eighth death.[1] The prevalence of Hypertension increases with advancing age to the point where more than half of people aged 60 to 69 years old and approximately three-fourths of those aged 70 years and older are affected.[2] The Blood Pressure, which is related to age is primarily responsible for an increase in both incidence and prevalence of Hypertension with increasing age.[3]

The Global Burden of Disease reported that in 1990 there were 5.2 million deaths from cardiovascular diseases in developed countries and 9.1 million developing countries. Treating raised blood pressure and maintaining it below 140/90 mmHg is associated with a reduction in cardiovascular complications.[4]

Corresponding Author: Sangeeta Jain Sharma
Email id: kind. Sangeeta @gmail.com

The situation in India is much more alarming due to high prevalence and related morbidity and mortality from Hypertension. According to W.H.O. statistics 2014 the prevalence of Hypertension in India was 23% and it is estimated that by the year 2025, the prevalence of Hypertension in urban India to be 29-45% in men and 25-38% in women. The annual loss of approximately US$ 500 billion due to major non-communicable diseases amounts to approximately 4% of gross domestic product for low and middle-income countries.[5]

The global status on Non- Communicable Diseases Report (2011) has reported that there were more than 2.5 million deaths from CVD in India in 2008, two-thirds due to coronary artery disease and one-third to stroke.[6]

Considering the rapid epidemiological transition in India and to see the impact of this among rural population, the current study has been undertaken to know the updated estimate of prevalence of HTN and its associated risk factors among rural population of district Muzaffarnagar.

Aims and Objectives: To Assess the prevalence of Hypertension and its association with various risk factors in the rural population of the district Muzaffarnagar.

Material And Methods: Study design: Community based, cross sectional study. **Study area:** Study was conducted in the catchment area of rural health training centre, village Bilaspur, a field practice area of the Department of Community Medicine, Muzaffarnagar Medical College, District Muzaffarnagar. **Study units:** Individuals 18 years and above. **Inclusion criteria:** Individuals aged 18 years and above, residing in the study area for last one year and who gave informed consent. **Exclusion criteria:** All pregnant ladies. Individuals who were very sick and not willing to be the part of the study. **Sample size:** Considering over all prevalence of Hypertension in rural India to be 17.9%.[7]

Sample size (N) $=4PQ/L^2$

P=Considered rural prevalence

Q = 100 - P

L =Permissible error of P (17% of prevalence)

N = 634+5% of N (Non-respondent error) = 634+32 = 666

However only 4.1% were actual non-respondents, that's why final sample size was 660.

634+4.1% of N=634+26=660

Sampling method: There were 1500 registered families at Rural health training Centre. We divided the study area in four zones and listed the houses of the registered families according to the zones. We collected the sample of 165 subjects from each zone and selected the houses of registered families of the concerned zone by random number table and from each house all the subjects who were fulfilling the inclusion criteria were included in the study. We visited the number of houses till we get the desired sample of 165 in one zone and repeated the same in other zones. **Data collection:** Semi structured and pré-tested questionnaire was used to elicit the required information from the study subjects. The questionnaire was pre-tested on (10% of the total sample size). Necessary modifications were made to overcome the difficulties encountered in pre-testing. Manual Mercury Sphygmomanometer was used for Blood Pressure recording and Portable Dial Weighing Machine, Stadiometer, Measuring Tape was used for anthropometry.

Blood Pressure Measurement Technique:

B.P. was measured manually with standardised Mercury Sphygmomanometer. For standardization, we took three B.P. instrument and three readings were taken with each of the three B.P. instrument in one subject, in almost same conditions. The instrument which gave most consistent reading was selected. Blood pressure was measured with the following precautions:

- Sitting posture with back supported, legs uncrossed and extra clothing's removed.
- Arms were relaxed and kept at the level of the heart with arm resting on the table.
- B.P. was measured in left arm.
- Size of the cuff was appropriate.
- Room temperature was comfortable and study subjects were advised to be relaxed and to take 5-minutes rest in sitting position.
- B.P. was measured 1 hour later, if subject gave history of smoking, exercise and caffeine intake.
- Cuff was inflated 30 mmHg above the level

at which radial pulse disappeared and then slowly cuff was deflated at 2mmHg/second and korotkoff sounds were observed with stethoscope placed over the brachial artery.

- The 1st (appearance) and the 5th (disappearance) sounds were recorded as indicative of systolic and diastolic blood pressure.
- Two readings of B.P. were taken in all the patients and three times in those patients who were showing variation of B.P. >10mm of Hg in two readings.
- Mean of all the readings was calculated.

Interpretation of B.P. readings:

Study subjects were labelled as Normotensive, Pre-hypertensive, Hypertensive stage I and Hypertensive stage 2 according to JNC-8 classification (2013)[8]

B.P. Classification	Systolic B.P. (m.m.of Hg)	Diastolic B.P. (m.m.of Hg)
Normal	<120 AND	<80
Pre-Hypertension	120-139 OR	80-89
Stage-1 Hypertension	140-159 OR	90-99
Stage-2 Hypertension	>160 OR	>100

Individuals who were taking anti-hypertensive for the last three months, were considered as known hypertensive, irrespective of their blood pressure level at the time of study.

Anthropometry

1- Height:

- Measured height with stadiometer.
- Back rested straight against the posterior surface of stadiometer with arms by the side of the body. Both the heels were touching the base of the stadiometer with no foot wear.
- Distance between the heel and top most portion of head was measured in centimeters, nearest to 0.5 centimeters.

2-Weight:

- Weight was measured with standardized portable dial weighing machine.
- Scale was set to zero and was rectified, if any error.
- Subjects were asked to stand still with feet 15 centimeter apart, with minimum clothing and no foot wear.
- Weight was measured to the nearest of 0.5 kilogram.

3-Waist circumference:

All upper clothing was kept above the waist, arms were crossed and hands were placed on the opposite shoulders and marked the highest point of lateral iliac border on both the sides and waist circumference was measured at this level by non-elastic measuring tape in centimeters.

4- Hip circumference:

Hip circumference was measured at the level of maximum protuberance of hips by non-elastic measuring tape, in standing position.

Variables studied: a. Dependent variables: Systolic and Diastolic blood pressures. b. independent variables: Age, dietary habits, amount of salt intake, level of physical activity, family history of Hypertension and Diabetes, smoking, alcohol consumption and obesity. Statistical analysis: Data entry and statistical analysis was performed by using MS excel and SPSS window version of 22.0 software. Interpretation and analysis of the study was done by using Chi-square test. P value was calculated to see the statistical association. If the P value was less than 0.05, association was considered as significant

Approval: Prior written approval was taken from institutional ethical committee and verbal consent was taken from the study subjects.

Study duration: About one and half year (01/03/2016 to 28/08/2017).

Results: This study was undertaken with the objectives to estimate the prevalence of HTN and association of risk factors with Hypertension. Results that have been drawn from the observations are as follows:

- Prevalence of Hypertension was observed to be 18.9 %, out of which 13.3 % were in stage I Hypertension and 5.6% were in stag ll Hypertension. 40.2 % were pre hypertensive and 40.9% were normotensive. (Table-1, Fig.-1)

- Prevalence of Hypertension was more in alcoholics, i.e., 37.3% as against 13.1% in non-alcoholic. This association was statistically significant. (Table-2)
- Prevalence of Hypertension was more in smokers, i.e., 58.6% as against 3.5% in non-smokers and the association was statistically significant. (Table-2)
- In the total study population, prevalence of Hypertension was more among sedentary workers as compared to heavy workers. This association that the Hypertension is higher in sedentary population was significant. (Table-2)
- Prevalence of Hypertension was more in non-vegetarians, i.e., 23.7% as against 14.9% in vegetarians (Table-2).
- It was revealed that Hypertension is more in study subjects in whom salt consumption was 5 gm or >5gm i.e., 20.1% as against 12.0% in study subjects in whom salt consumption was <5gm. This association was statistically non- significant as value of p>0.05(Table-2).
- There were 8% of study subjects, who gave positive family history of Diabetes and out of these 49.1 % were hypertensive. 14 % study subjects show positive family history of Hypertension and out of these 34.8% were Hypertensive. There were 13.5% study subjects who gave positive family history of Diabetes and Hypertension both and among those 58.4% were Hypertensive. The association between positive family history of Hypertension and Diabetes and prevalence of Hypertension among study subjects was significant as the value of p was <0.05.(Table-3)
- In the total study population, prevalence of Hypertension in obese subjects found to be 61.9%, as against 36.8%,17.1% and 13% in pre-obese, normal and underweight respectively. These differences were statistically highly significant. (Table-3)
- In the total study population, prevalence of Hypertension in study subjects with WHR> cut off value was found to be 53.8% and in study subjects with WHR ≤ cut off value was found to be 14.2%. This observation was statistically highly significant. (Table-3)
- Study shows that the prevalence of Hypertension in age group of 60 years and above was 46.5% and there was increasing trend of prevalence of Hypertension with age, which was statistically highly significant as value of p was<0.05. (Table-3)

Discussion

This study was undertaken to estimate the prevalence of Hypertension, and association of risk factors in the Rural area of District Muzaffarnagar. Studies are not available in the District Muzaffarnagar in regard to this topic but many studies have been conducted regarding the same, in other Districts of Uttar Pradesh and other states. There are some similarities as well as some variations observed between the result of this study and the studies conducted by others on the same topic, which is discussed here as follows.

In our study, the overall prevalence of HTN is 18.9%. Our study reported a prevalence towards lower side when compared to other studies by Bharadwaj et al, who reported the prevalence of 30% among rural inhabitants.[9] Yadav et al, who reported the prevalence of Hypertension as 32.2% .[10]

The prevalence rates of HTN are variable from place to place depending on the cut-off point for Hypertension used and the method employed in measurement of blood pressure. Mohan et al from Chennai have shown prevalence of HTN to be 20%.[11] Gupta et al have shown a prevalence of 21.1% in rural India, which is almost at par with our study.[12]The prevalence of 14.5% in rural Lucknow is comparatively lower than our study.

Our study shows that around half of the population was in pre HTN group (40.2%). These participants in pre HTN stage are of great interest, since chances of progression to HTN is high. Studies have already established that relationship between BP and risk of cardiovascular disease is continuous, consistent and independent of other risk factors and pre-hypertensive have a greater chance to go in to HTN.

Our study reveals higher prevalence of Hypertension in alcoholics, smokers, obese, non-vegetarians, elderly and sedentary life style subjects. The prevalence of Hypertension among vegetarians was lesser as compared to non-vegetarians in our study. This finding is in line with finding of Bhadoria et al who also reported prevalence of HTN more in non-vegetarians than vegetarians.[13] In our study,

only 3.3% study subjects were obese. The prevalence of HTN in obese subjects was 61.9% which is much higher from the studies by Vimal et al and Rodger et al.[14,15]

Prevalence of Hypertension is directly related to the increased salt intake and in our study 20.1% were hypertensive with an intake of >5gm/day. Findings of our study were in line with study of Radhika et al who reported an association of HTN with excess salt intake in south Indian population. Most studies have also reported that there are several communities whose intake of sodium chloride is 3 g or less per day have low average blood pressure. When these people migrate to communities where the daily salt intake is 7 to 8 g, their blood pressure increases proportionately due to exposure to new social environments with changes of dietary habits. Radhika found that mean dietary salt intake (8.5 g/d) in the population was higher than the recommended by the World Health Organization (< 5 g/d). This study also revealed that there was higher salt intake among elderly persons and higher income group population. Studies also showed that compared to zero added salt (38.5% vs 23.3%, p < 0001), addition of salt > 1 teaspoon/day at the dining table was associated with a higher prevalence for Hypertension. The INTER SALT study of 10079 men and women at 52 centers from 32 countries projected that a 100 umol/day lower sodium intake over a lifetime would result in a 9 mmHg smaller rise in systolic pressure from 25 to 55 years age. The INTER SALT study also demonstrated a clear relationship between salt intake and *level* of blood pressure among communities. The study of railway employees in India, with 15.2% Hypertension in south Indians and 6.2% in north Indians with twice/as much salt intake in the north than in the south, the results are totally at variance with the accepted views.[16,17,18,19]

Table 1: Prevalence of hypertension in study subjects as per JNC-8 criteria

Classification of Hypertension	Total (N=660)	
	No.	%
Normal	270	40.9
Pre-HTN	265	40.2
Stage I HTN	88	13.3
Stage II HTN	37	5.6
Total HTN=13.3 +5.6 =18.9%		
Total	660	100

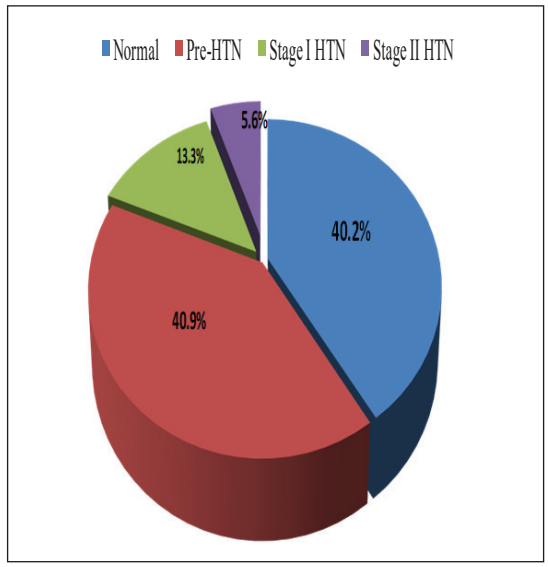

Fig 1: Prevalence of hypertension in study subjects as per JNC-8 criteria

Table 2: prevalence of hypertension in study subjects having risk factors of addiction, physical inactivity and diet (N=660)

Risk factors	HTN Absent(n=535)		HTN Present (n=125)	
	No.	%	No.	%
1-Alcohol				
Present(n=158)	99	62.6	59	37.4
Absent(n=502)	436	86.9	66	13.1
χ^2=45.821, df=1, p=0.00001, Highly significant				

Conti.. Table 2: prevalence of hypertension in study subjects having risk factors of addiction, physical inactivity and diet (N=660)

2-Smoking				
Smokers(n=184)	76	41.4	108	58.6
Non-smokers(n=476)	459	96.5	17	3.5
χ^2=262.657, df=1, p=0.00001, Highly significant				
3-Physical Activity				
Heavy Worker(n=96)	84	87.5	12	12.5
Moderate(n=320)	269	84.1	51	15.9
sedentary(n=244)	182	74.5	62	25.5
χ^2= 11.12, df=2, p=0.0038, Significant				
4-Dietary Habits				
Non-Vegetarian(n=303)	231	76.3	72	23.7
Vegetarian(n=357)	304	85.1	53	14.9
χ^2= 8.48, df=1, p=0.003, Significant				
5-Amount of salt intake				
< 5 gms (n=98)	86	88	12	12
5 gms or >(n=562)	449	79.9	113	20.1
χ^2 = 3.359, df=1, p=0.0668, non-Significant				

Table 3: Prevalence of hypertension in the subjects having the risk factors of positive family history of HTN and diabetes, obesity, and advanced age (N=660)

Risk factors	HTN Absent(n=535)		HTN Present(n=125)	
	No.	%	No.	%
1-Family history of diseases				
Diabetes(n=53)	27	50.9	26	49.1
HTN(n=92)	60	65.2	32	34.8
Diabetes& HTN (n=89)	37	41.6	52	58.4
Absent(n=426)	411	97.0	15	3.0
χ^2=123.97, df=3, p=0.0001, Significant				
2--BMI				
≥ 30(n=21)	8	38.1	13	61.9
25 – 29.9(n=57)	36	63.2	21	36.8
18.5 – 24.9(n=327)	271	82.9	56	17.1
<18.5(n=255)	220	87	35	13
χ^2=42.367, df=3, p=0.0001, Significant				
3-WHR				
≥Normal (n=78)	36	46.2	42	53.8
<Normal (n=582)	499	85.8	83	14.2

Conti..Table 3: Prevalence of hypertension in the subjects having the risk factors of positive family history of HTN and diabetes, obesity, and advanced age (N=660)

Risk factors	HTN Absent(n=535)		HTN Present(n=125)	
	No.	%	No.	%
χ^2=70.20, df=1, p=.00001, Highly significant				
4-Age in years				
<20 (n=61)	60	98.4	1	1.6
20-30 (n=203)	183	90.2	20	9.8
30-40 (n=191)	168	88	23	12
40-50 (n=109)	71	65.1	38	34.9
50-60(n=53)	30	56.6	23	43.4
60& above(n=43)	23	53.5	20	46.5
χ^2=86.61, df=5, p =0.00001, Highly Significant				

Abbreviations

B.P.	Blood pressure
BMI	Body mass index
CVD	Cardio vascular disease
CHD	Congestive heart disease
HTN	Hypertension
JNC	Joint national committee
NCD	Non-communicable diseases
WHO	World health organization
WC	Waist circumference
WHR	Waist to hip ratio

Conclusions

This study was undertaken with the objectives to estimate the prevalence of Hypertension and assessment of specific risk factors. Prevalence of Hypertension was observed to be 18.9 %, out of which 13.3 % were in stage I Hypertension and 5.6% were in stag ll Hypertension. Prevalence of Hypertension was more in elderly, alcoholics, smokers, non-vegetarians, sedentary population, obese and persons with high WHR and subjects with higher intake of the salt, and these association was mostly statistically significant.

Recommendations

Indian health system is challenged with increasing prevalence of non-communicable diseases and HTN being one of the major. This urges a strong need to improve health care at policy, community and family level by incorporating prevention, surveillance, treatment and appropriate management. One factor which can help is by regular re-training, enhancement and upgrading skills of health care professionals providing Hypertension related care. Thus, control of HTN can provide an access point in reduction of other cardio vascular disease mortality. Population based interventional approaches like reduction of salt intake, tobacco avoidance and regular physical activity can be incorporated in the control programs.

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