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Risk factors associated with hypertension among adults in rural area

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Abstract
The overall average prevalence of Hypertension in the world was estimated as 35% (37% in men and 31% in women). Hypertension has become a significant problem, being already established in high income courtiers and also emerging in low and middle income countries. (LMICs) experiencing epidemiological transition from communicable to non-communicable chronic diseases. The participants were interviewed and examined individually. At the end of the interview and examination, study participants were counselled regarding the importance of getting their blood pressure checked at frequent intervals and obtaining treatment if levels were higher than normal. Among hypertensives, 83.9% were those who did not consume smokeless form of tobacco. Majority of participants who are in hypertensive stage were unemployed. There is a statistically significant association between work status and blood pressure status ($p< 0.001$).

Keywords: Risk factors, hypertension, rural area

Introduction
Hypertension is an important public health challenge, which affects approximately one billion persons worldwide. Approximately 7.6 million deaths (13-15%) of the total) and 92 million disability adjusted life years world were attributable to high blood pressure in 2001. Hypertension doubles the risk of cardiovascular diseases, including coronary heart disease (CHD), congestive heart failure (CHF), ischemic and hemorrhagic stroke, renal failure and peripheral arterial disease [1]. It is often associated with additional cardiovascular disease risk factors and the risk of cardiovascular disease increases with the total burden of risk factors. Although antihypertensive therapy clearly reduces the risks of cardiovascular and renal disease, large segments of the hypertensive population are either untreated or inadequately treated. The overall average prevalence of Hypertension in the world was estimated as 35% (37% in men and 31% in women). Hypertension has become a significant problem, being already established in high income courtiers and also emerging in low and middle income countries. (LMICs) experiencing epidemiological transition from communicable to non-communicable chronic diseases [2].

Increases in rates of Hypertension and other cardiovascular disease, representing an emerging public health problem in LMICs, happen as populations grow older, become urbanized and lifestyle changes favour sedentary habits, physical inactivity, obesity, increasing alcohol consumption and salt intake, among others. Despite effective therapies and lifestyle interventions, optimal control of blood pressure remains a challenge for many LMICs, partly due to poor adherence to pharmacological and lifestyle therapies. Health services need to control emerging chronic diseases in LMICs, even though health resources are limited and have to be shared with the simultaneous demands of continuing infectious diseases. Hypertension represents a key target for health services because it can be influenced by both lifestyle and drug based strategies [3].

Lifestyle measures for lowering blood pressure, such as reducing salt intake and alcohol consumption, increasing physical activity, controlling overweight and obesity, avoiding stress, and others can potentially reduced requirement for antihypertensive medications and prevent high blood pressure from developing in non-hypertensives.

These measures are also important for controlling other cardiovascular disease (CVD) risk factors, such as hypercholesterolemia, or diabetes, illustrating the importance of a multi-factorial approach for reducing risk among hypertensives [4].

Methodology

A validated, structured, pre-tested questionnaire was used. Participants were interviewed, examined and questionnaires were filled on the spot.

The participants were interviewed and examined individually. At the end of the interview and examination, study participants were counselled regarding the importance of getting their blood pressure checked at frequent intervals and obtaining treatment if levels were higher than normal.

At the end of the survey 20% of the total participants (20% of 76 =147) were called for blood investigations. Out of 147 participants, 60 reported to tese two camps. Community based camps were organized 1 day for each area. Their blood samples were sent to Thyrocare laboratories. Following investigations were done: 1. Fasting blood sugar (FBS) 2. Total Cholesterol (TC) 3. Triglyceride (G) 4. High density lipoprotein (HDL) 5. Low density lipoprotein (LDL).

Logistics used

1. **Mercury sphygmomanometer:** Blood pressure was measured with a standard mercury sphygmomanometer which was standardized and checked regularly to minimize errors.
2. **Stethoscope:** A standard Littmann stethoscope was used to record the blood pressure.
3. **Weighing machine:** A bathroom weighing scale was used to measure the weight of the participants. It was calibrated and checked regularly.
4. **Measuring tape:** a non-elastic measuring tape was used to measure height, waist and hip circumference.

Blood pressure measurement

Instrument: Mercury column sphygmomanometer of recording the blood pressure. To minimize any error in the recording of blood pressure, the sphygmomanometer was standardized each time before measuring blood pressure and also serviced when necessary.

Method: During the course of the interview, three measurements of blood pressure were made on each study participants with the mercury column sphygmomanometer using the standardized technique. Study participants were instructed to refrain from drinking any beverage containing caffeine, smoking tobacco chewing and any physical exertion just before or during measurement of BP. The blood pressure measurements were obtained only after the subject had rested for at least 5 minutes in a sitting position. The first reading was recorded after obtaining the socio demographic information from the study subject, while the second and third were recorded after completion of the interview. Care was taken to maintain a minimum 3 minute interval between each of the 3 readings. All blood pressure measurements were made on the right arm, using a cuff of appropriate size at the level of the heart using the same instrument. The cuff pressure was inflated 30mm Hg above the level at which radial pulse disappeared, then deflated slowly at the rate of 2mm Hg. Per second and the reading recorded to the nearest 2mm Hg. The first (appearance) and the fifth (disappearance) Korotkoff sounds were recorded as indicative of systolic blood pressure reading was calculated by taking the average of the three recordings obtained.

Anthropometry

Weight: Body weight was measured in Kilogram with the subject standing motionless on the weighing scale, the feet spread about 10cm apart, and the weight equally distributed on each leg. Subjects were made to remove their footwear and heavy clothing while their weight was being measured.

Height: it was measured in centimetres with the subject in an erect position against a vertical surface, with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the boy orbit.

Body mass index; BMI was calculated using the formula BMI = weight in kilograms/(Height in meters) 2.

Waist circumference: Measurement was made according to the WHO STEPS protocol for measuring waist circumference which instructs that the measurement be made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest.

Hip circumference: was measured around the widest protion of the buttocks, with the tape parallel to the floor.

Results

Table 1: Distribution of study participants according to Work status and Blood Pressure status

Serial No.	Work Status	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Govt. Employee	1(0.2)	0(0.0)	1(1.1)	2(0.3)
2	Non-Govt. Employee	151(26.6)	41(50.6)	17(19.5)	209(28.4)
3	Self-employed	165(29.1)	8(8.9)	30(34.5)	203(27.6)
4	Non-paid	0(0.0)	0(0.0)	1(1.1)	1(0.1)
5	Student	53(9.3)	4(4.9)	0(0.0)	57(7.7)
6	Unemployed	197(34.7)	27(33.3)	38(43.6)	262(35.6)
7	Retired	1(0.2)	1(1.2)	0(0.0)	2(0.3)
	Total	568(100)	81(100)	87(100)	736(100.0)

Fisher's Exact

Majority of participants who are in hypertensive stage were unemployed. There is a statistically significant association between work status and blood pressure status ($p< 0.001$).

Table 2: Distribution of study participants according to Socio-economic status and Blood Pressure status

Serial no.	Socio-economic status	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Upper Class	11(1.9)	2(2.5)	2(2.3)	15(2.0)
2	Upper Middle class	113(19.9)	10(12.3)	17(19.5)	140(19.0)
3	Middle class	172(30.3)	29(35.8)	23(26.4)	224(30.4)
4	Lower middle class	234(41.2)	30(37.0)	38(43.7)	302(41.0)
5	Lower class	38(6.7)	10(12.3)	7(8.0)	55(7.5)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =7.486. p=0.462

Among hypertensive, 43.7% were from Lower Middle Class, 26.4% from Middle Class and 19.5% were from Upper Middle Class.

Table 3: Distribution of study participants according to smoking of Tobacco products and Blood Pressure status

Serial No.	Tobacco smoking	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Yes	63(11.1)	9(11.1)	19(21.8)	91(12.4)
2	No	505(100.0)	72(88.9)	68(78.2)	645(87.6)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =7.350. p=0.025

There is an association between tobacco smoking and hypertension (p=0.025.)

Table 4: Distribution of study participants according to consumption of smokeless form of tobacco and Blood Pressure status

Serial No.	Smokeless form of tobacco	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Yes	46(8.1)	6(7.4)	14(16.1)	66(9.0)
2	No	522(91.9)	75(92.6)	73(83.9)	670(91.0)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =5.548. p=0.061

Among hypertensives, 83.9% were those who did not consume smokeless form of tobacco.

Table 5: Distribution of study participants according to Alcohol consumption and Blood Pressure status

Serial No.	Alcohol consumption	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Yes	26(4.6)	4(4.9)	1(1.1)	31(4.2)
2	No	542(95.4)	77(95.1)	86(98.9)	705(95.8)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =2.268. p=0.326

There is no association between consumption of alcohol and Blood Pressure status.

Table 6: Distribution of study participants according to type of oil used for cooking and Blood Pressure status

Serial No.	Type of oil	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	Palm Oil	26(4.6)	3(3.7)	2(2.3)	31(4.2)
2	Sunflower Oil	273(48.1)	39(48.1)	45(51.7)	357(48.5)
	Coconut Oil	269(47.4)	39(48.1)	40(46.0)	348(47.3)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =0.926. p=0.925

This table shows that there is no association between type of oil used and blood pressure status.

Table 7: Distribution of study participants according to total calories consumed in a day and Blood Pressure status

Serial No.	Type calories (in Keal)	Blood Pressure Status (N=736)			Total Number (%)
		Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
1	<1500	12(2.1)	1(1.2)	2(2.3)	15(2.0)
2	1500-2000	345(60.7)	46(56.8)	49(56.3)	440(59.8)
3	2000-2500	179(31.5)	27(33.3)	30(34.5)	236(32.1)
4	>2500	32(5.6)	7(8.6)	6(6.9)	45(6.1)
	Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Fisher's Exact test: x2 =2.386. p=0.884

There is no association between total calories consumed in a day and Blood Pressure status.

Table 8: Distribution of study participants according to type of physical activity and Blood Pressure status

Physical activity	Blood Pressure Status (N=736)			Total Number (%)
	Normotensive Number (%)	Prehypertension Number (%)	Hypertensive Number (%)	
Vigorous intensity activity	101(17.8)	18(22.2)	16(18.4)	135(18.3)
Moderate intensity activity	403(70.9)	21(25.9)	36(41.4)	460(62.5)
sedentary	64(11.3)	42(51.9)	35(40.2)	141(19.2)
Total	568(100.0)	81(100.0)	87(100.0)	736(100.0)

Chi-square test: x2 =114.61; df=4, p=0.00001

The above table highlights the fact that there is a correlation between intensity of physical activity and the blood pressure status. ($p< 0.001$).

Discussion

Majority of participants who were in hypertensive stage were unemployed. There is a statistically significant association between work status and blood pressure status ($p< 0.001$). Unemployed participants are 1.5 times more prone to develop hypertension than employed participants (OR=1.47).

Schumann B *et al*. [5] did a study on East German population aged 45-83 years in 2011 to explore the association between occupational groups and prevalent hypertension. Highest prevalence ratios were observed in metal processing workers/carpenters/painters, Electricians technicians/ forewomen, scrutinisers/storekeepers, and food-processing occupations compared to office clerks. Takashima *et al*. [6] compared the measures of blood pressure between eight occupational categories using data from a health checkup for 589 middle aged Japanese males, randomly selected from five areas in Japam. Blood pressure levels were found to be higher for personnel in transport and communications, clerical personnel, managerial and civil personnel and the professional and technical personnel.

In a study done by Ismail M [7] in 2012, prevalence of hypertension was 10-13% in people involved in agricultural sector, collies, maids, dhobis etc., in rural part of Sullia Taluk, D.K. District.

There is no association between SES and blood pressure status. In a study done by Ismail M67, hypertension was found to be more common in upper SES compared to lower SES. A study done by Khadikar HA *et al*. [8] in Maharashtra reported that upper class individuals were at highest risk of developing hypertension.

However in studies done by Grotto I *et al*. [9] and Colhoun HM *et al*. [10] observed it is seen that lower SES is associated with higher blood pressure. Gaudemaris R *et al*. [11] in study reported that prevalence of hypertension was found to be higher among lower occupational categories.

Gulliford MC *et al*. [12] in a study found a negative association of systolic blood pressure with increasing income or education in women. There was no consistent association between education or income and blood pressure in men.

In this study, there was an increased proportion of smokers among hypertensives (21.8%) as compared to among normotensives (11.1%). There is an association between tobacco smoking and hypertension (p=0.025). Smokers are 2.2 times more prone to develop hypertension than non-smokers (OR=2.23).

In a study by Ismail M[7] in D.K. District, prevalence of HTN was 29.3% among smokers and 18.8% among non-smokers.

In a study conducted by Saeed A *et al*. 75 in Saudi a higher prevalence of hypertension was found smokers as compared to non-smokers.

Thuy AB *et al*. [13] examined the association between smoking and hypertension in a population based sample of Vietnamese men. Hypertension was associated with smoking in a dose response manner when characterised as number of years of smoking and lifetime cigarette consumption.

Virdis A *et al*. [14] observed that cigarette smoking acutely exerts a hypertensive effect, mainly through the stimulation of the sympathetic nervous system.

Primatesta P *et al*. [15] used cross-sectional data from 3 yrs (1994 to 1996) of the annual Health Survey for England to investigate any difference in blood pressure between smokers and non-smokers in a nationally representative sample of adults (>16yrs old). They observed that older male smokers had higher BP than did nonsmoking men.

In a cross-sectional study in Shiraz, Iran by Abtahi F *et al*. [16] it was observed that BP was greater in heavy smokers than those who smoked < 20 packs/year.

Pradhan D [17] performed a study to see the association between smoking and hypertension with data from the Ukraine Household Survey, conducted in the 8 regions of Ukraine in 2009. There was no association between smoking and development of hypertension.

In the present study, there is no association between consumption of smokeless form of tobacco and blood pressure status. In a study done by Sharma AK *et al*. [18] in

rural Rajasthan, there was an acute increase in blood pressure among those who consumed pan masala.

Pandey A *et al*. [19] reported that smokeless tobacco consumption is associated with increased prevalence of high blood pressure in the rural adult male population. Westman JC [20] found that smokeless tobacco caused a clinically significant elevation of blood pressure.

Among 736 participants, only 31 reported consumption of alcohol. Alcohol consumption is low in this population as majority are Muslims or it may be underreported because of societal stigma among them. There is no association between alcohol consumption and hypertension in this study.

In a study done by Wamala JF *et al*. [80] in Uganda, it was found that the odds of developing hypertension was 2.28 times in people consuming alcohol than that of non-alcoholic people.

Chacon EM *et al*. [22] conducted a study on hypertension in Costa Rica and inferred that the odds of people consuming alcohol to develop hypertension was 1.36 times that of non-alcoholic people. Todkar S *et al*. [23] in rural Maharashtra found a positive association between alcohol consumption and development of hypertension. Lag T *et al*. [24] examined relationship between alcohol consumption and hypertension in 6632 subjects, employed in a cross sectional study in Paris. Alcohol consumption was found to be a major risk factor for hypertension in the population. Cross sectional and prospective epidemiological studies have established a relationship between and prospective epidemiological studies have established a relationship between hypertension and alcohol consumption. A prospective study by Saunders JB *et al*. [25] has indicated increasing blood pressure over time and an elevated risk of developing overt hypertension with consumption alcohol.

Criqui MH *et al*. [26] examined the relationship between alcohol consumption and blood pressure in 2482 men and 2301women 20yrs age or older in nine North American populations. Analysis showed BP in both men and women to be positively and significantly ($p< 0.05$) related to alcohol consumption. Fuchs FD *et al*. [27] examined the relationship between alcohol consumption and hypertension in a study in 8334 participants aged 45-64yrs of age, they inferred that the consumption of alcohol was an independent risk factor for hypertension in North American population.

Conclusion

Unemployment, sedentary work style, high BMI, higher WHR, extra salt intake in diet were found to be risk factors for hypertension in this study.

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