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RESEARCH ARTICLE

SOCIO-DEMOGRAPHIC AND ECONOMIC FACTORS ASSOCIATED WITH HYPERTENSION AMONG MEN IN INDIA

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ABSTRACT

BACKGROUND:

The leading risk factor for cardiovascular disease, Hypertension, is becoming more prevalent worldwide and is especially prevalent in low- and middle-income nations (LMICs) like India.

OBJECTIVE:

This study aims to examine the change in the prevalence of Hypertension and to develop a statistical model for risk factors of Hypertension among Men in India.

MATERIALS AND METHODS:

This study used data from the National Family Health Survey (NFHS 4 and 5) samples of men aged 15-54 years whose blood pressure (BP) was measured during the survey.

RESULTS:

The study shows that the prevalence of Hypertension among men was 16.3% to 21.5% from NFHS-4 to 5 and we also found an increase in the prevalence of Hypertension and association across selected socio-demographic and economic variables for Hypertension. It was found in both NFHS 4 and 5 Hypertension were higher in the 45-54 age group compared to younger age group. Men who consume alcohol had higher odds (OR: 1.32, C.I: 1.27-1.37 and OR: 1.42, C.I: 1.37-1.48) of getting hypertension than those who do not consume alcohol and Education, Employment, marital status, and residence were showing significantly associated and higher odds with hypertension among Men. The accuracy of the logistic regression model has been calibrated to reach 71.1%, with sensitivity and specificity exceeding 70%. Users of the model have access to the modified probabilities.

CONCLUSION:

The findings suggest the effect of socioeconomic and habit factors on hypertension which will help in improved interaction with medical services for the treatment of hypertension.

KEYWORDS

Socio-Demographic factors, Economic factors, Hypertension, India

INTRODUCTION

India is a diverse country, and several of its states are undergoing epidemiological health changes brought on by urbanization. Urbanization has fueled food consumption, increased cigarette use, and alcohol, and reduced physical activity as a result of economic prosperity. The spectrum of illnesses is changing from communicable to non-communicable diseases (NCDs) as a result of this economic revolution [1]. NCDs are a broad category of illnesses that include chronic respiratory conditions, cancer, Hypertension, diabetes, and cardiovascular conditions [2]. Hypertension, commonly referred to as high or rising blood pressure, also known as the silent killer, is a serious risk factor for many non-communicable diseases and has grown to be a significant global public health problem due to the high rate of premature deaths globally [3, 4]. In addition to being a frequent risk factor for peripheral vascular disease, retinopathy, nephropathy, dementia, and cognitive decline, hypertension also raises the risk of cardiovascular disease, including atherosclerosis, heart disease, heart failure, stroke, and angina [5].

High systolic blood pressure (SBP) has been linked to roughly 10.4 million deaths and 218 million disability-adjusted life years (DALY) in 2017, according to the global burden of disease (GBD) research. High SBP contributed to 9% of all DALYs overall [6]. A list of the six primary risk factors contributing to the global illness burden included hypertension, which was in third place globally, after hazardous sexual behavior and underweight [7]. According to estimates from the World Health Organisation (WHO), there are presently over 1.13 billion individuals with hypertension, and two-thirds of them reside in low- and middle-income nations (LMIC) [8]. A significant cause of mortality and disability in South Asian nations including Bangladesh, India, Nepal, Bhutan, and Sri Lanka is hypertension and its associated problems [9]. According to the Global Burden of Hypertension Study, 199 million Indians had hypertension in 2015, and the prevalence of hypertension in India and its states is on the rise [10]. The recent study has shown the Countrywide prevalence of hypertension was 18.3%. Men with 21.5% were found to have a higher prevalence as compared to women with 14.8% in India [11]. In India, hypertension is a major risk factor for 15% of all deaths from cardiovascular diseases and accounts for 5.1% of mortality overall [12].

Regardless of geography, educational attainment, or family financial position, recent population-based research has demonstrated that the prevalence of hypertension is comparatively greater in middle and older age groups [13]. Significantly, India's rates of hypertension prevalence in younger age groups surpass those of Central and Eastern Europe, which was previously thought to have the greatest prevalence of hypertension globally [10]. Several studies have found that the main risk factors for hypertension include age, obesity, dietary habits, behavioral factors, regional heterogeneity, family history, and socioeconomic level [14–16]. But these studies do not provide any appropriate statistical models for the risk factors of Hypertension.

Even so, the lack of regularly available data has restricted research on hypertension in India, and the few studies that have been conducted thus far have either been conducted on a local scale with a small sample size or in conjunction with other non-communicable illnesses [17, 18]. This may be because, up until recently, India lacked a representative data set at the national, regional, or district levels. Fortunately, there is a rare chance to examine the shift in the prevalence of hypertension and its related variables among males aged 15 to 54 according to the most recent cycle of the National Family Health Survey (NFHS-4 and NFHS-5). The majority of hypertension research included data on older age groups. Since younger people are thought to have a reduced risk of contracting the disease, they are typically ignored. Therefore, the present study will focus on determining the change in the prevalence of Hypertension as well as ascertaining the statistical model that allows us to determine which socioeconomic and demographic characteristics are major risk factors of hypertension as well as assist in analyzing the interactions and determining which factors are most strongly linked to Hypertension.

MATERIALS AND METHODS

DATA SOURCE

Data from the 4th and 5th rounds of the NFHS, Indian Demographic and Health Survey (DHS), were used in the study. The NFHS was established in the early 1990s, and it frequently publishes data on India's population, health, and nutrition for the country's states and union territories under the leadership of the Ministry of Health and Family Welfare (MoHFW). NFHS considers overall India and sample houses were chosen based on the proportion of urban and

rural residents in each state. The multistage sample setup was used in every state. The U.S. Centers for Disease Control and Prevention (CDC) evaluated and approved the survey procedure, which included the substance of all survey questionnaires. The IIPS and ICF Institutional Review Boards also approved the protocol. The NFHS's study design, sampling procedures, and data-gathering information had been made public in NFHS reports.[19]

The 5th round of the NFHS was gathered from 28 states, 8 union territories, and 707 districts between 2019 and 2021. The 4th round of the NFHS was collected between 2015 and 2016 from 29 states, 7 union territories, and 640 districts. Hypertension measurements were gathered for the first time in India through the NFHS survey. To estimate key indicators, it includes data on the health and family welfare of 112,122 men ages 15-54 and 699,686 women between the ages of 15 and 49 in NFHS-4 and there are 724,115 women ages 15-49 and 101,839 males between the ages of 15 and 54 information available in NFHS-5. For this study, we focused on the male sample in NFHS-4 and NFHS-5.

VARIABLES' DESCRIPTIONS

Outcome variable

The measurements of Blood Pressure (BP) for each respondent were taken three times at intervals of five minutes using the OMRON BP monitor by a skilled health investigator. Though, the BP level was calculated by taking the average of the last two measurements. A person whose average systolic blood pressure (SBP) was greater than or equal to 140 mmHg or average diastolic blood pressure (DBP) was greater than or equal to 90 mmHg or a person who is currently taking prescribed medicine to lower his/her elevated BP was considered to be hypertensive. For analysis, we constructed a dichotomous hypertension variable where samples with hypertension (defined earlier) were given code1 and non-hypertensive as 0 in both NFHS-4 and NFHS-5.

Predictor variables

We considered demographic and socio-economic characteristics as covariates to identify the important risk factors associated with hypertension among men. Age was categorized as 15–24, 25–34, 35–44, and 45-54 for men in both NFHS-4 and NFHS-5 respectively. Other demographic and socio-economic information includes place of residence (rural or urban), education level (No education, primary, secondary or higher), occupation (Unemployed, employed, agriculture), Marital status (Unmarried and Ever_Married), Religion (Hindus, Muslims or others), Caste (SC/ST, OBC or others), wealth Index (poorest, poorer, middle, richer or richest). The lifestyle factors include frequency of Drinking alcohol (yes or no), consumption and Tobacco use (yes or no), and Region (north, center, east, northeast, west, south) in India.

STATISTICAL ANALYSIS

In this study, we used, bivariate, and multivariabel logistic regressions were employed for the data analyses. Descriptive statistics were employed to show how research participants were distributed. Bivariate analyses were conducted to better understand the type of association between explanatory factors and outcome variables. Pearson's Chi-square statistic was used to conduct the association and Student's z-test was used to calculate the significant difference between the 2 survey rounds. Further, the binary logistic regression model was used to evaluate the risk factors for developing Hypertension and estimated odds ratios (ORs) and 95% confidence intervals (CIs) were used to display the regression results. Additionally, the analyses employed suitable sample weights and a 2-tailed P-value of less than 0.05 to verify the statistical significance and we used the ROC curve to evaluate the performance of the Regression model. Data analysis was carried out using the IBM. SPSS (Statistical Package for the Social Sciences) version 26, Bengaluru, Karnataka, India.

MULTIVARIABEL TECHNIQUE FOR DEVELOPING THE STATISTICAL MODEL

Binary logistic regression is estimated to know the odds of getting Hypertension in each category of variables. For this statistical model the dependent variable should have a binary outcome and independent variables can be continuous or categorical. The following binary logistic regression model has been used in this study.

$$log\left(\frac{p}{1-p}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n$$

Define $f(x)$ as $= \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n$

Were, $p = \frac{e^{f(x)}}{1+e^{f(x)}}$ & $q = 1 - p$

RESULTS

TABLE 1 PREVALENCE OF HYPERTENSION AMONG MEN IN INDIA BY SELECTED BACKGROUND CHARACTERISTICS AND THEIR ASSOCIATION

Variables	NFHS-4			NFHS-5			Percentage change (%)
	HTN		Chi-Square (P-value)	HTN		Chi-Square (P-value)	
	Prevalence (%)	n		Prevalence (%)	n		
Age group							
15-24	6.7	35712	6480.5 (0.000)	6.9	31070	7364.0 (0.000)	2.99
25-34*	15.7	30791		16.6	27652		5.73
35-44*	24.3	25851		26.7	23712		9.88
45-54*	31.7	19768		35.9	19405		13.25
Place of residency							
Urban*	19.6	35526	143.6 (0.000)	21.8	26420	100.0 (0.000)	11.22
Rural*	16.7	76596		18.9	75419		13.17
Religion							
Hindu*	17.3	83567	273.7 (0.000)	19.6	77211	392.1 (0.000)	13.29
Muslim	15.5	15438		15	12112		-3.23
Other*	22.5	13117		25	12516		11.11
Caste							
SC/ST	17.9	39901	128.01 (0.001)	20.4	38594	48.0 (0.000)	13.97
OBC*	16.3	43434		18.7	39326		14.72
Others*	19.7	22564		20.7	18968		5.08
Educational level							
No education*	19	15007	184.3 (0.000)	22.8	12269	219.7 (0.000)	20.00
Primary*	19.1	14351		23.1	11710		20.94
Secondary*	16.4	65260		18.4	60018		12.20
Higher	20.1	17504		19.5	17842		-2.99
Region							
North	19.5	24584	948.5	20	21134	458.5	2.56

Canter*	13.8	27930	(0.000)	18.8	23242	(0.000)	36.23
East*	14.1	17220		16	15197		13.48
Northeast	24	14555		23.2	14860		-3.33
West*	17.5	12349		16.4	11588		-6.29
South*	19.8	15484		23.2	15818		17.17
Marital status							
Unmarried	8.8	40003	3330.1 (0.000)	9.2	36892	3993.5 (0.000)	4.55
Ever Married*	22.5	72119		25.6	64947		13.78
Occupation							
Employed*	20.7	54062	1317.5 (0.000)	22.9	49491	1801.3 (0.000)	10.63
Unemployed*	10.2	24889		8.8	19241		-13.73
Agriculture*	18.2	32961		21.2	32864		16.48
Wealth index							
Poorest*	13.2	18412	767.7 (0.000)	16.8	19796	325.9 (0.000)	27.27
Poorer*	14.7	23220		18.1	22599		23.13
Middle*	17.4	24331		19.6	21715		12.64
Richer	20.1	23383		21.1	20209		4.98
Richest*	21.9	22776		23.4	17520		6.85
Tobacco							
No*	17.1	72818	47.8 (0.001)	18.1	61850	244.1 (0.000)	5.85
Yes*	18.7	39304		22.1	39989		18.18
Drink alcohol							
No*	15.4	76840	805.1 (0.000)	17	75391	1370.5 (0.000)	10.39
Yes*	22.4	35282		27.5	26448		22.77

* Significant difference in percentage change between NFHS-4 and NFHS-5 (using student z-test) at 5% level of significance

Note: SC: Scheduled Caste ST: Scheduled Tribe OBC: Other Backward Class

Table 1 describes the percentage of prevalence of Hypertension in Men of NFHS-4 and NFHS-5 with various background traits and their association. In this research, every explanatory variable was associated with Hypertension in both rounds. The highest prevalence (31.7% and 35.9%) of Hypertension in men was found in the age-group of 45-54 in both groups and the percentage change was statistically significant. The population in the urban areas had the highest prevalence of hypertension (19.6% and 21.8%), and the percentage shift was statistically significant. In religion with the highest prevalence of hypertension (22.5% and 25.0%) was seen in other religions. Religion-wise, the percentage shift was statistically significant. In terms of caste, the General caste had a

greater chance of hypertension (19.7% and 20.7%) among men, in both rounds of the NFHS survey. The highest prevalence of hypertension (20.1%) was identified in higher educated people, although the highest prevalence of (23.1%) according to NFHS-5 was found in primary educated people. In India, the Northeast has the greatest prevalence of hypertension (24.0% and 23.3%), in both NFHS-4 and 5, and in NFHS-5 south region also shows the highest prevalence and the rise is statistically significant. In Marita status, Ever Married had the highest prevalence (22.5% and 25.6%) of Hypertension, and the percentage change was statistically significant. In terms of occupation, those who are employees had the highest prevalence of hypertension (20.7% and 22.9%) in both NFHS-4 and NFHS-5. The population with the Richest class had the highest prevalence of hypertension (21.9% and 23.4%), and the percentage change was likewise statistically significant. Those who are taking tobacco have the highest prevalence (18.7% and 22.1%) of Hypertension and the percentage change is also statistically significant alcohol users had the highest prevalence of hypertension (22.4% and 27.5%), and the percentage change was likewise statistically significant.

TABLE 2: ADJUSTED ODDS RATIO FOR AN ASSOCIATION OF COVARIATES WITH HYPERTENSION AMONG MEN IN INDIA, NATIONAL FAMILY HEALTH SURVEY-4 AND NATIONAL FAMILY HEALTH SURVEY-5

	NFHS-4				NFHS-5			
	Exp(B)	95% C.I EXP(B)		p-value	Exp(B)	95% C.I EXP(B)		p-value
Variables		Lower	Upper			Lower	Upper	
Age group								
15-24	1				1			
25-34	2.083	1.948	2.227	0.000	2.104	1.963	2.256	0.000
35-44	3.561	3.311	3.83	0.000	3.667	3.398	3.956	0.000
45-49	5.196	4.823	5.599	0.000	5.836	5.402	6.305	0.000
Place of Residence								
Urban	1				1			
Rural	1.009	0.968	1.052	0.65	0.959	0.918	1.002	0.06
Religion								
Hindu	1				1			
Muslim	0.968	0.912	1.027	0.27	0.806	0.756	0.859	0.000
Other	1.006	0.95	1.066	0.82	1.25	1.18	1.324	0.000
Caste								
SC/ST	1				1			
OBC	0.928	0.89	0.968	0.002	0.93	0.892	0.969	0.001
Other	1	0.952	1.05	0.996	0.991	0.942	1.042	0.71
Education								
Higher	1				1			
No Education	0.804	0.751	0.861	0.001	0.858	0.802	0.919	0.001
Primary	0.86	0.805	0.918	0.000	0.946	0.885	1.011	0.1
Secondary	0.868	0.827	0.911	0.000	0.963	0.918	1.011	0.12
Region								
North	1				1			
Centre	0.731	0.694	0.771	0.001	1.058	1.003	1.116	0.04
East	0.733	0.69	0.779	0.02	0.808	0.758	0.861	0.001
Northeast	1.308	1.229	1.392	0.000	1.085	1.016	1.157	0.000

West	0.87	0.818	0.925	0.002	0.804	0.754	0.858	0.003
South	0.906	0.856	0.959	0.001	1.08	1.021	1.143	0.000
Marital status								
Unmarried	1				1			
Married	1.224	1.154	1.299	0.000	1.217	1.146	1.292	0.000
Wealth Index								
Richest	1				1			
Poorest	0.626	0.582	0.674	0.003	0.7	0.651	0.752	0.000
Poorer	0.673	0.632	0.717	0.000	0.768	0.721	0.819	0.001
Middle	0.808	0.764	0.855	0.000	0.828	0.78	0.878	0.002
Richer	0.944	0.897	0.993	0.001	0.909	0.861	0.961	0.000
Occupation								
Employed	1				1			
Unemployed	0.91	0.86	0.962	0.001	0.832	0.778	0.889	0.000
Agriculture	0.892	0.856	0.929	0.001	0.877	0.843	0.913	0.000
Tobacco								
No	1				1			
Yes	0.954	0.919	0.989	0.02	0.965	0.93	1.002	0.06
Alcohol								
No	1				1			
Yes	1.317	1.269	1.366	0.001	1.419	1.365	1.475	0.000

An analysis using a logistic regression model was conducted to determine which demographic and socioeconomic characteristics were the main causes of hypertension in India. Table 2 displays characteristics, odds ratio, and probability of having hypertension. Except for residence type, religion, and tobacco usage, the majority of the predictor variables showed significant differences and higher odds of Hypertension in both rounds. It was found in NFHS-4 and 5 that the odds of hypertension were higher (OR: 5.20, C.I: 4.82-5.60 and OR: 5.84, C.I: 5.40-6.31) in the 45-54 age group compared to younger age. In the case of education, the lower odds (OR: 0.80, C.I: 0.75-0.86 and OR: 0.86, C.I: 0.80-0.92) were observed in illiterate men compared to higher educated men. Those who are unemployed had lower odds (OR: 0.91, C.I: 0.86-0.96 and OR: 0.83, C.I: 0.78-0.89) of getting hypertension compared to employees which is statistically significant. Men who consume alcohol had higher odds (OR: 1.32, C.I: 1.27-1.37 and OR: 1.42, C.I: 1.37-1.48) of getting hypertension than those who do not consume alcohol. Men who are married had higher odds (OR: 1.22, C.I: 1.15-1.30 and OR: 1.22, C.I: 1.15-1.29) of getting hypertension compared to Unmarried. Caste, wealth index of the household, and geographic region had shown a significant difference in the odds of getting hypertension compared to their reference group.

Table 3 reveals the likely sensitivity and specificity of the model from both NFHS-4 and 5 as 70.0% and 60.3%, respectively. Sensitivity and specificity can be changed based on the needs of the study, and the screening or diagnosis that is required. The area under the Reciever Operating Characteristics (ROC) curve in NFHS-4 (Fig 1) was 70.05% with 95% CI 70.1%–70.9% and in NFHS-5 (Fig 2)71.1% with 95% C.I 70.7% - 71.5%.

TABLE 3: SENSITIVITY AND SPECIFICITY OF THE MODEL AT DIFFERENT CUT POINTS

NFHS-4			NFHS-5		
Probability (≥)	Sensitivity	Specificity	Probability (≥)	Sensitivity	Specificity
0.084	0.915	0.301	0.083	0.908	0.310
0.086	0.909	0.313	0.088	0.900	0.327

0.096	0.890	0.353	0.094	0.890	0.347
0.101	0.880	0.371	0.121	0.850	0.415
0.137	0.810	0.480	0.126	0.840	0.428
0.142	0.800	0.494	0.145	0.800	0.485
0.146	0.790	0.506	0.150	0.790	0.499
0.172	0.720	0.585	0.170	0.739	0.562
0.175	0.710	0.594	0.176	0.721	0.580
0.178	0.700	0.603	0.176	0.719	0.581
0.182	0.690	0.615	0.182	0.700	0.601
0.185	0.680	0.624	0.186	0.691	0.610
0.187	0.670	0.633	0.187	0.689	0.612
0.190	0.660	0.642	0.189	0.679	0.621
0.193	0.650	0.651	0.196	0.660	0.641
0.196	0.640	0.660	0.196	0.659	0.642
0.199	0.630	0.669	0.203	0.641	0.658
0.202	0.620	0.677	0.203	0.639	0.659
0.204	0.610	0.685	0.208	0.621	0.677
0.206	0.600	0.694	0.208	0.619	0.678
0.239	0.500	0.769	0.235	0.530	0.746
0.293	0.320	0.874	0.244	0.500	0.768
0.268	0.400	0.831	0.298	0.311	0.876

FIGURE 1: RECEIVER OPERATING CHARACTERISTIC CURVE FOR PREVALENCE AND RISK FACTOR OF HYPERTENSION AMONG MEN IN NFHS-4, WITH AREA: 70.5%, 95% CONFIDENCE INTERVAL:70.1% –70.9%.

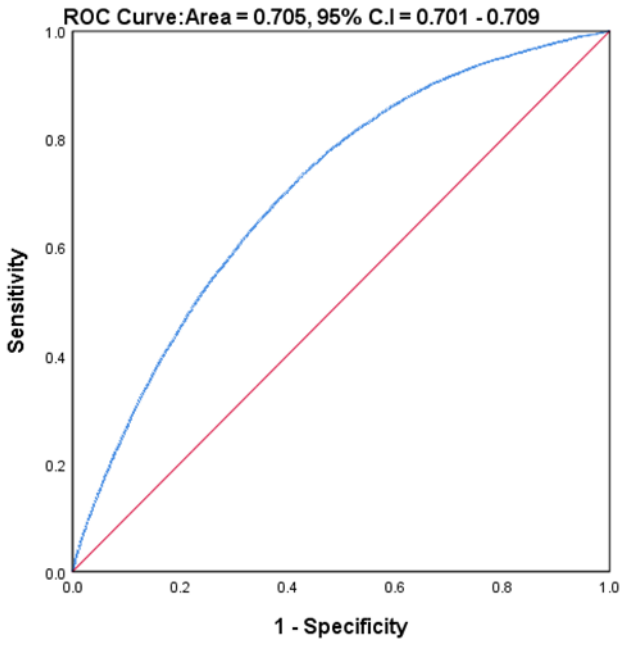

FIGURE 2: RECEIVER OPERATING CHARACTERISTIC CURVE FOR PREVALENCE AND RISK FACTOR OF HYPERTENSION AMONG MEN IN NFHS-5, WITH AREA: 71.1%, 95% CONFIDENCE INTERVAL:70.7% –71.5%

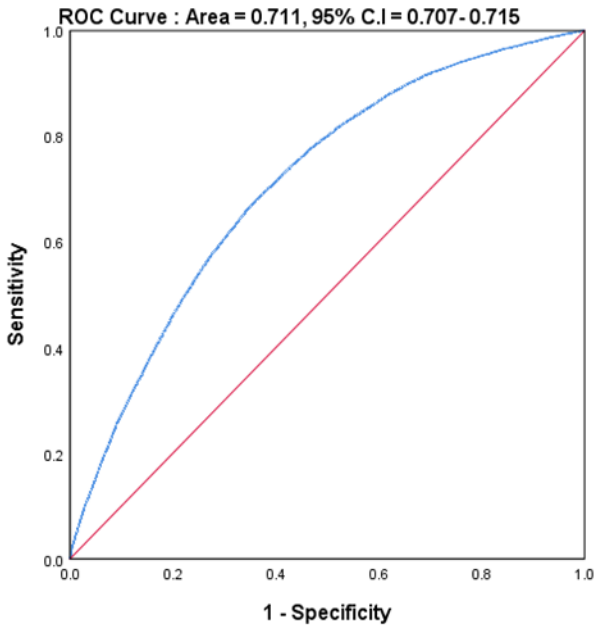

FIGURE 3: PREVALENCE OF HYPERTENSION AMONG MEN IN INDIA AND ITS STATE FROM NFHS-4 AND NFHS-5

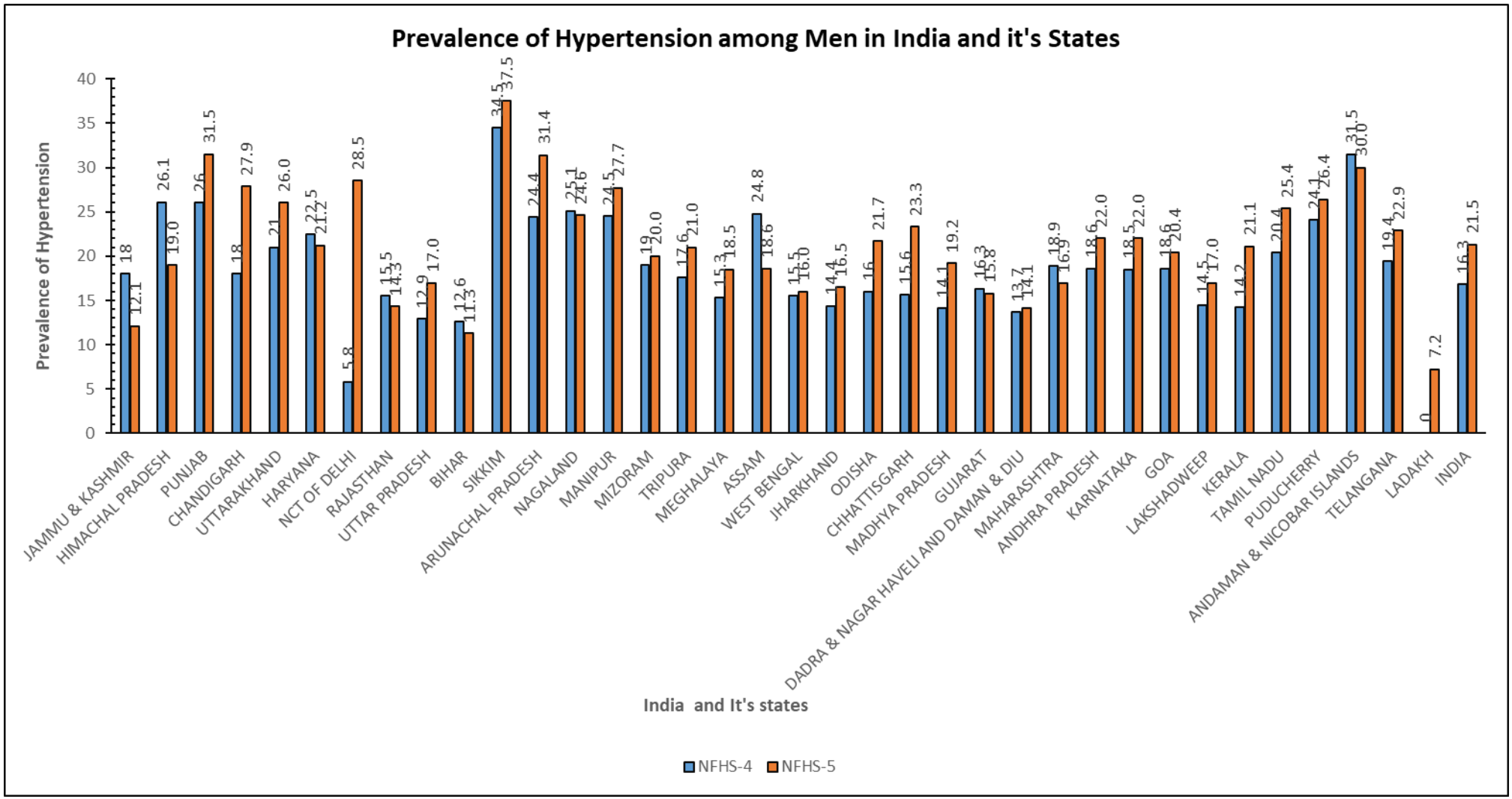

Figure 3 shows certain Indian states and union territories (UTs) exhibit a notable fluctuation in the prevalence of hypertension among Men from NFHS-4 to NFHS-5, as depicted in the bar graph. For example, the prevalence of hypertension was rising sharply in Chhattisgarh (15.6% to 23.30%), Kerala (14.2% to 21.10%), Odisha (16% to 21.70%), Madya Pradesh (14.1% to 19.20%), and Uttar Pradesh (12.9% to 17.00%) among the states. The states of Jammu and Kashmir (18% to 12.10%), Himachal Pradesh (26.1% to 19.00%), and Assam (24.8% to 18.60%) are showing a decrease in the prevalence of hypertension. some of the union territories (UTs) are reporting the highest prevalence of Hypertension found in the northern region of Delhi (5.8% to 28.50%) and Chandigarh (18% to 27.90%).

DISCUSSION

This research is an innovative effort to examine changes in the prevalence of hypertension and develop a statistical model for determining risk factors for hypertension among males 15-54 years in India using a nationally representative data set of NFHS-4 and 5. Moreover, the present study has also plotted the prevalence of hypertension by state in India. Targeting men and alcohol use is important when it comes to managing hypertension. The findings of the present study emphasized that the prevalence of Hypertension by all selected background characteristics is much higher in NFHS-4 to NFHS-5.

This present study showed that from NFHS-4 to NFHS-5 the prevalence of hypertension among men in the 15-54 age group was increased from (16.3% to 21.5%) [19]. Which is statistically significant. However, our research revealed that the odds of hypertension were rising as people aged which is statistically significant in both the rounds of NFHS 4 and 5, similar findings were also supported by earlier research [20, 21]. A potential cause for the increased incidence of hypertension in older age groups is a combination of a heavy workload and inactivity. Additionally, the walls of the arteries and aorta thicken with age, which raises blood pressure. In NFHS-4, the prevalence of hypertension was highest in men with higher education levels. This may be because these men mostly hold professional or clerical jobs and are less likely to engage in intense physical activity, have sedentary lifestyles, or consume higher-fat foods [22]. However, the prevalence of Hypertension with higher education in NFHS-5 reduced and this difference was not statistically significant. Previous studies also showed hypertension is higher among well-educated people as compared with illiterate [21, 23].

According to the study, people with employment have a higher chance of hypertension than people without jobs. While workers in farming and production have less exposure to an inactive lifestyle and engage in intense physical activity, professionals have fewer possibilities for physical mobility and lead sedentary lifestyles [3]. Furthermore, there is a statistically significant increase in the prevalence of hypertension among working-class individuals in both NFHS-4 and 5. WHO also supported workplace wellness initiatives as a means of reducing hypertension [24]. The occurrence of hypertension and odds of hypertension in scheduled caste and scheduled tribe is increasing from round 4 to 5. Which was statistically significant. Tribes often have lower levels of educational fulfillment, labor market possibilities, and social flexibility due to their historical exclusion from social and economic chances. Scheduled castes and tribes may be more susceptible to psychological stressors related to their socioeconomic disadvantage as a result of these structural causes. Psychosocial stresses have been linked to the development of chronic illnesses like hypertension using stress-related regulation mechanisms [25, 26].

The higher rate of hypertension in men living in urban areas is a statistically significant result because of their busy lifestyles, decreased physical activity, and stressful environments. It also shows that urban residents' prevalence of hypertension increased from the fourth to the fifth round of the National Family Health Survey. Hypertension of married men was higher in both rounds as well as odds of hypertension are significantly increasing. It may be because of increased responsibilities, a heavier workload, and less time spent on beneficial activities like regular exercise [22, 27]. Additionally, compared to the poorest groups the richest groups in our study had a higher prevalence of hypertension, a finding that has been confirmed by earlier research [21, 22]. NFHS-4 and 5 reported the higher prevalence of Hypertension in the richest group and it is statistically significant. However, in both surveys, it was discovered that using tobacco in particular was highly linked to an increased risk of hypertension. A few passages in the article supported our findings that smoking raises the risk of hypertension [28–30], although other epidemiological research has demonstrated a connection between current smoking with either the same or lower level of blood pressure [31].

Regular alcohol usage, particularly daily alcohol intake, has been linked to considerably increased odds of hypertension. The study also reveals a statistically significant increase in the prevalence of hypertension among alcoholic men in both rounds of the National Family Health Survey. Numerous academic publications backed up our conclusions that there is a significant association between alcohol use and a high prevalence of hypertension [21, 22, 32]. The northeastern and northern states pose the greatest risk from hypertension, followed by a few states in the southern region. High intakes of salt, tobacco, and alcohol have been linked to elevated blood pressure in the northeastern and northern states, according to a prior study [22, 33, 34]. The variation in dietary and cultural patterns amongst states is associated with variations in the prevalence and risk of hypertension at the state level [35]. The logistic regression model developed for healthcare professionals had a likely sensitivity and specificity of 70.0% and 60.3% from NFHS-4 and 5, respectively. However, if needed to meet the goals of the study (for screening or diagnosis), sensitivity and specificity can be changed [Figures 2 and 3].

While the study presents important information about hypertension, it has certain limitations. For example, the results are restricted to men aged 15 to 54. Furthermore, it ignores additional risk factors that may contribute to the high prevalence of hypertension in young adults, such as cholesterol levels, hereditary factors, obesity, stress, and anxiety. In addition, the cross-sectional data employed in this study were unable to explain the temporal link between the explanatory and outcome factors. Using a hierarchical modeling technique could improve regional differences' plausibility and discrimination.

CONCLUSION

This study made an effort to close a significant gap in the national and state studies on hypertension. The findings point to a sharp rise in the prevalence of hypertension in men in NFHS rounds 4 and 5, as well as some of the major risk factors for the disease in India. Consequently, these comparison studies may be useful for medical interventions aimed at slowing the progression of this illness. Apart from leading well-balanced lives and eating a healthy diet, workplace wellness programs for professionals, early detection of hypertension, and educating young people from impoverished communities such as rural areas or minority communities about the importance of health education could all be crucial preventative measures against hypertension. Therefore, it is crucial to concentrate on the prevalence and risk factors throughout India while developing strong health programs and policies for the management of hypertension.

ABBREVIATIONS

NFHS	National Family Health Survey
IIPS	International Institute for Population Sciences
MoHFW	Ministry of Health and Family Welfare
UTs	Union Territories
NCD	Non-communicable diseases
ROC	Receiver operating characteristic curve

References:

1. Mohan V, Deepa R. Risk factors for coronary artery disease in Indians. J Assoc Physicians India 2004; 52: 95–97.
2. Non communicable diseases, https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (accessed 5 September 2023).
3. Kearney PM, Whelton M, Reynolds K, et al. Global burden of hypertension: analysis of worldwide data. Lancet 2005; 365: 217–223.
4. Rahman M, Williams G, Mamun AA. Hypertension and diabetes prevalence among adults with moderately increased BMI (23·0-24·9 kg/m2): findings from a nationwide survey in Bangladesh. Public Health Nutr 2017; 20: 1343–1350.
5. Verdecchia P, Schillaci G, Reboldi G, et al. Different prognostic impact of 24-hour mean blood pressure and pulse pressure on stroke and coronary artery disease in essential hypertension. Circulation 2001; 103: 2579–2584.
6. GBD 2017 Risk Factor Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018; 392: 1923–1994.
7. Ezzati M, Lopez AD, Rodgers A, et al. Selected major risk factors and global and regional burden of disease. Lancet 2002; 360: 1347–1360.
8. Hypertension, https://www.who.int/news-room/fact-sheets/detail/hypertension (accessed 8 August 2023).
9. Krishnan A, Garg R, Kahandaliyanage A. Hypertension in the South-East Asia Regional: an overview. Pusat

Informasi Kesehatan Masyarakat, https://lib.fkm.ui.ac.id (accessed 11 December 2023).
10. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1479 population-based measurement studies with 19·1 million participants. Lancet 2017; 389: 37–55.
11. Guthi VR, Kumar DSS, Kumar S, et al. Hypertension treatment cascade among men and women of reproductive age group in India: analysis of National Family Health Survey-5 (2019–2021). The Lancet Regional Health - Southeast Asia; 0. Epub ahead of print 21 September 2023. DOI: 10.1016/j.lansea.2023.100271.
12. ORGI MCCD NEW | Government of India, https://censusindia.gov.in/census.website/node/381 (accessed 11 December 2023).
13. Geldsetzer P, Manne-Goehler J, Theilmann M, et al. Diabetes and Hypertension in India: A Nationally Representative Study of 1.3 Million Adults. JAMA Intern Med 2018; 178: 363–372.
14. Yu G, Fu H, Huang W, et al. A Dietary Pattern of Higher Fish, Egg, Milk, Nut, Vegetable and Fruit, and Lower Salt Intake Correlates With the Prevalence and Control of Hypertension. American Journal of Hypertension 2018; 31: 679–686.
15. Esteghamati A, Abbasi M, Alikhani S, et al. Prevalence, Awareness, Treatment, and Risk Factors Associated With Hypertension in the Iranian Population: The National Survey of Risk Factors for Noncommunicable Diseases of Iran. American Journal of Hypertension 2008; 21: 620–626.
16. American Journal of Hypertension | Oxford Academic. OUP Academic, https://academic.oup.com/ajh/ajh (accessed 11 December 2023).
17. Ghosh S, Mukhopadhyay S, Barik A. Sex differences in the risk profile of hypertension: a cross-sectional study. BMJ Open 2016; 6: e010085.
18. Bansal SK, Goel D, Saxena V, et al. The prevalence of hypertension and hypertension risk factors in a rural Indian community: A prospective door-to-door study. Journal of Cardiovascular Disease Research 2012; 3: 117–123.
19. International Institute for Population Sciences (IIPS), https://www.iipsindia.ac.in/(accessed 28 August 2023).
20. Tabrizi JS, Sadeghi-Bazargani H, Farahbakhsh M, et al. Prevalence and Associated Factors of Prehypertension and Hypertension in Iranian Population: The Lifestyle Promotion Project (LPP). PLOS ONE 2016; 11: e0165264.
21. Bhise MD, Patra S. Prevalence and correlates of hypertension in Maharashtra, India: A multilevel analysis. PLOS ONE 2018; 13: e0191948.
22. Ghosh S, Kumar M. Prevalence and associated risk factors of hypertension among persons aged 15-49 in India: a cross-sectional study. BMJ Open 2019; 9: e029714.
23. Gender differences in the regulation of blood pressure. Hypertension 2001; 37: 1199–1208.
24. World Health Organization (WHO), https://www.who.int/ (accessed 13 December 2023).
25. McEwen BS, Gianaros PJ. Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. Ann N Y Acad Sci 2010; 1186: 190–222.
26. Spruill TM. Chronic Psychosocial Stress and Hypertension. Curr Hypertens Rep 2010; 12: 10–16.
27. Hasan M, Sutradhar I, Akter T, et al. Prevalence and determinants of hypertension among adult population in Nepal: Data from Nepal Demographic and Health Survey 2016. PLoS ONE 2018; 13: e0198028.
28. Al-Safi SA. Does smoking affect blood pressure and heart rate? Eur J Cardiovasc Nurs 2005; 4: 286–289.
29. Primatesta P, Falaschetti E, Gupta S, et al. Association between smoking and blood pressure: evidence from the health survey for England. Hypertension 2001; 37: 187–193.
30. Thuy AB, Blizzard L, Schmidt MD, et al. The association between smoking and hypertension in a population-based sample of Vietnamese men. J Hypertens 2010; 28: 245–250.
31. Green MS, Jucha E, Luz Y. Blood pressure in smokers and nonsmokers: epidemiologic findings. Am Heart J 1986; 111: 932–940.
32. Singh S, Shankar R, Singh GP. Prevalence and Associated Risk Factors of Hypertension: A Cross-Sectional Study in Urban Varanasi. International Journal of Hypertension 2017; 2017: e5491838.
33. Hazarika NC, Biswas D, Mahanta J. Hypertension in the elderly population of Assam. J Assoc Physicians India 2003; 51: 567–573.
34. Kishore J, Gupta N, Kohli C, et al. Prevalence of Hypertension and Determination of Its Risk Factors in Rural Delhi. International Journal of Hypertension 2016; 2016: e7962595.
35. Anchala R, Kannuri NK, Pant H, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. Journal of Hypertension 2014; 32: 1170–1177.