Original Article

Tobacco smoking and blood pressure: How are they related among the Indians? – A secondary analysis of National Family Health Survey (NFHS)-4 data

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ABSTRACT

Background: India, the second leading producer of tobacco, puts the population at a higher chance of tobacco consumption contributing to a significant disease burden. Though tobacco smoking is a modifiable risk factor for hypertension and has been on the rise among the population, studies on the relationship of tobacco with hypertension are limited in India. **Aim:** This study aimed to assess the population-level risk of tobacco (smoke) use and elevated blood pressure (BP) among Indians and also assess the association of risk of tobacco smoking with hypertension based on the place of residence. **Materials and Methods:** Data from the National Family Health Survey (NFHS)-4 conducted between January 2015 and December 2016 was utilized. The prevalence of hypertension and its magnitude of association with smoking factors was found using univariable logistic regression. Multivariable logistic regression was performed to predict the association of smoking products with elevated BP by adjusting the model for sociodemographic factors, illness, physical characteristics, and state-wise data. **Results:** The weighted prevalence of hypertension was 16.56% (confidence interval [CI]: 16.34–16.78) in males and 11.20% (CI: 11.12–11.27) in females. Among those who smoked tobacco, 15.3% women and 22.4% men were hypertensive. This study highlights the significant association of smoking of various tobacco products with hypertension in both men and women on univariate analysis. But the adjusted mean elevated BP among the tobacco-using males and females was not significantly associated with smoking cigarettes, pipe, cigars, and hookah. **Conclusion:** Cigarette smoking is a modifiable factor for the development and progression of hypertension. Adequate preventive and promotive health measures targeting the young, rural inhabitants and the poorer sections of society may help in reducing tobacco consumption.

Keywords: Health Promotion, hypertension, prevention, smoking, tobacco

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Introduction

Hypertension (HTN), often called a silent killer disease, is defined as a systolic pressure of 140 mm Hg or higher or a diastolic pressure of 90 mmHg or higher as per Joint National Committee (JNC-7) criteria.[1] Elevated blood pressure (BP) is a leading cause of renal disease, cardiovascular and cerebrovascular diseases.[2,3]

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Similarly, tobacco consumption is a major risk factor for diabetes, cancer, cardiovascular and cerebrovascular morbidity.[4,5] India is the second leading producer and consumer of tobacco; nearly 267 million adults (29% of all adults) use tobacco and 38.7% of adults are exposed to secondhand smoke at home.[6-8] Similarly, the overall prevalence of HTN in India was 29.8% as per a systematic review done in 2014, and the study found that only one-tenth of rural and one-fifth of urban people have their BP under control.[9]

Among several risk factors which lead to HTN, tobacco use is one of the modifiable risk factors with proven targeted health promotion strategies.[10,11] The use of tobacco is also increased due to changes in lifestyle, peer pressure, for recreational purposes, and is considered as an easy stress-relieving agent by the masses.[12,13] Scientifically, nicotine in tobacco stimulates the sympathetic nervous system, which leads to an elevation in BP.[14,15] Nicotine in tobacco smoke causes vasoconstriction due to the release of epinephrine and norepinephrine.[14] Smoking can also lead to damage of the vascular wall by causing impaired prostacyclin production, resulting in loss of elasticity of the vessels, and stiffening, which ultimately accelerates the process of atherosclerosis, leading to HTN.[16]

Various studies[17-20] have suggested significant positive relationship between tobacco smoking and HTN, while few studies[21] have found no significant relation between tobacco smoking and BP. However, to the best of our knowledge, studies linking tobacco use and HTN are scarce in South Asia and India. Also, there exists sociodemographic and cultural differences across India and there are no studies done demonstrating the association of tobacco smoking and HTN on large survey data sets in India. Since cigarette smoking is a modifiable risk factor for HTN and has been on the rise in the population, the present study aims to assess the population-level risk of tobacco (smoke) use and elevated BP among the men and women (15–54 years of age) of India and also assess association of the risk of tobacco smoking with HTN based on the place of residence using the national survey data (2015–2016).

Materials and Methods

Data Source and Sampling

The National Family Health Survey (NFHS) is being conducted at regular intervals in a representative sample of the general population at the national, state, and district levels. We have used data from the fourth round of the NFHS conducted between January 2015 and December 2016 for this study. International Institute for Population Science (IIPS), Mumbai is a nodal agency for the survey, and it has been supported by the Ministry of Health and Family Welfare, India, ORC Macro, USA, and East-west center, Hawaii. The NFHS 4 provides data on fertility, maternal and child health, reproductive health, anemia, nutrition, family planning, and infant mortality using three different questionnaires – household questionnaire, women's questionnaire, and village questionnaire – covering over 29 states

and six union territories. The additional parameters like blood glucose and BP were measured for the first time in the NFHS-4.

The survey adopted a two-stage stratified random sampling. In the first stage, selection of primary sampling units (PSUs), that is, villages, with probability proportional to population size (PPS) and census enumeration blocks in urban areas was done and the second stage involved systematic selection of households within each PSU. Exactly 601,509 households were interviewed and a total of 699,686 women aged 15–49 years and 112,122 men aged 15–54 years participated in the survey.

Data Variables

The outcome variable for this study was elevated BP, measurements of which were taken thrice with an interval of 5 min between the readings and the average taken and recorded on Q315 to Q337 on the survey form. Those individuals with average systolic BP >140 mmHg or average diastolic BP >90 mmHg were considered to have elevated BP. The exposure variable was tobacco smoking, which was based on the following questions from the survey: "(Q604) Do you currently smoke cigarettes?, (Q605) In the last 24 h, how many cigarettes did you smoke?, (Q606) Do you currently smoke bidis?, (Q607) In the last 24 h, how many bidis did you smoke?, (Q608) Do you currently smoke or use tobacco in any other form?, (Q609) In what other form do you currently smoke or use tobacco? Cigar-A, Pipe-B, Hookaah-C." The covariates in the study were based on the following questions: "(Q103) How old were you at your last birthday?, (Q116) What is your religion?- Hindu/Christian/Muslim/Others, (Q108) What is the highest standard you completed? Type of PSU-Urban-1/Rural-2, (Q213) What is your current marital status? single/married/divorced. Wealth index, richest, rich, middle, poor, poorest, was calculated in the NFHS based on a series of questions (Q37) assessing the household's ownership of selected assets such as television, bicycles, materials for housing construction, types of water access, sanitation facilities, and so on. Based on the principal component analysis, the households were categorized into five groups to compare the influence of wealth on the health status and among the various populations. The confounding factors considered in our study were based on the following questions from the survey: "(Q622) Do you currently have diabetes?, (Q615) Do you drink alcohol?" Other confounding factors considered before measuring BP were based on the following question: (Q312) "Have you done any of the following within the past 30 min: a) eaten anything b) had coffee, tea, or other drink that has caffeine? c) smoked any tobacco product?"

Data Analysis

The variables were first summarized using population-level frequencies, and stratified frequencies for the relevant subgroups were calculated. Outcome variables were described as frequency distribution for estimating prevalence, with confidence interval (CI) ranges. The overall prevalence (95% CI) of HTN at the national and state levels was calculated, along with a

description of the 95% CI. The magnitude of association with smoking was found using univariable logistic regression. Multivariable logistic regression was then performed to predict the association of smoking with elevated BP by adjusting the model for sociodemographic factors, illness and addiction history, physical characteristics, and state-wise data. Exposure variables for multivariable logistic regression were selected based on *P* value less than and equal to 0.2 in univariate logistic regression analysis and contextually important variables. STATA 16.1 (Stata Corp., College Station, TX, USA) software was used for the analysis, and adjustment for sampling weight, cluster, and strata was done using "svyset" command.

Ethical Approval

The study was ethically approved by the institute's ethics committee, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh (PGI/IEC/2021/001139).

Results

A total of 811,808 individuals were included in this cross-sectional study, among whom 112,122 (13.8%) were males and 699,686 (86.2%) were females. According to the JNC-7 classification, the weighted prevalence of HTN in this study was found to be 16.56% (18,186/n = 109,800) with a CI of 16.34–16.78 in males and 11.20% (77,298/n = 690,149) with a CI of 11.12–11.27 in females. State-wise prevalence of HTN for males was highest in the state of Sikkim and lowest in Delhi. In females, the state-wise prevalence of HTN was highest in Sikkim and lowest in the state of Rajasthan. For men, the odds ratio (OR) for HTN were 1.20 times higher for those living in the rich socioeconomic background (based on wealth quintile), 1.28 times higher for married men and 1.37 times higher for separated/widowed men compared to unmarried men and men with lower level of education. For women, OR for having HTN was 1.07 times higher among the rich compared to poorest, 1.40 times higher for married women, and 1.50 times higher for separated/widowed women compared to married women. Physical characteristics like overweight body mass index, diabetes, and addiction to alcohol consumption increased the odds of HTN among both men and women.

[Table 1] shows the sociodemographic profile of study individuals compared across four different groups. Majority of the study participants were in neither smokers nor hypertensive category. The percentage of tobacco smokers with HTN was found to be more in the urban area (4.55% males, 0.66% females) than in the rural areas (4.24% males, 0.138 females). Among Socioeconomic Status (SES) categories, middle and rich class had higher percentage of smokers with HTN. Those with no formal education had a higher percentage (7.27% males, 0.31% females) of smokers with HTN. Those individuals who were in divorced/widowed category had a higher percentage (9.85% males, 0.32% females) of smokers with HTN.

Out of 699,686 women, 8216 (1.17%) smoked tobacco products, while out of 112,122 males, 30,455 (27.16%) smoked

tobacco products. Smoking tobacco was more prevalent in males compared to females across all age groups. Also, increased tobacco use was seen in people above the age of 40 years- 36.7% (11,646) among males and 2.65% (3962) among females. Among the different forms of tobacco smoked, bidi smoking was found to be most common in females (0.56%). In males, cigarette smoking (15.53%) was more prevalent followed by bidi smoking (15.52%). Among those who smoked tobacco, 15.3% (1226/n = 8011) women and 22.4% (5353/n = 29,185) males were hypertensives. Univariable logistics regression found a significant association of HTN with smoking of cigarettes, pipe, hookah, and bidi among both males and females [Table 2].

[Figures 1 and 2] describe the state-wise proportion of HTN among male and female tobacco smokers, respectively. The highest proportion of hypertensive males smoking tobacco was found in the state of Mizoram and the lowest proportion was found in Delhi. Similarly, the highest proportion of females smoking tobacco was found in the state of Mizoram and the lowest proportion was found in Chandigarh.

Table 3 shows the adjusted OR (aOR) estimated from the multivariable logistic regression analysis of males and females separately. After adjustment of age variable, along with state-wise adjustment of data and the confounding factors, the elevation of BP was found not to be significantly associated with smoking of tobacco products. The confounding factors such as smoking cigarettes or any tobacco products or coffee drinking before 30 min of BP measurement were found to be significantly associated with elevation of BP.

Discussion

This study assessed the association of tobacco smoking with HTN in Indian women and men using the NFHS-4 data. The study findings revealed that male smokers aged above 40 years had 3.4 (3.17–3.80) times higher risk for HTN and female smokers above 40 years had 4.59 (4.44–4.75) times higher odds for HTN, when compared to those aged 15–29 years. Among both males and females, HTN was found to increase as age increases and women were found to be at greater risk, which is similar to that reported in other studies.[22,23] Bidi smoking was most common across all age groups in females, whereas in males, cigarette smoking (14.1%) was common in young age and bidi smoking (25.8%) was common above 40 years of age. Bidi smoking (males- 24.2%, females- 1.16%) was found to be more common among the poorest, and cigarette smoking (males- 15.17%, females- 0.35%) was common among the rich, classified based on wealth index. The probable reason could be that both median price and the cheapest bidi stick in India cost very much less than the price of median cigarette and cheapest cigarette, respectively.[24]

Premenopausal females are protected against HTN due to the cardioprotective nature of estrogen, and the protection is found to be lost in obesity and diabetes mellitus (DM).[25,26] HTN was found to be an independent risk factor for DM in a study done

Table 1: Sociodemographic profile of study participants

Sociodemographic factors	Tobacco smokers with hypertension		Hypertensive, not a smoker		Smokers without hypertension		Neither smokers nor hypertensives		P	
	Male n (%)	Female n (%)	Male n (%)	Female n (%)	Male n (%)	Female n (%)	Male n (%)	Female n (%)	Male	Female
Place of residence										
Rural	3600 (4.24)	926 (0.138)	7860 (10.6)	51,340 (10.2)	17,181 (21.4)	5323 (0.829)	44,896 (63.7)	423,719 (88.8)	0.0	0.0
Urban	1753 (4.55)	300 (0.666)	4630 (13.4)	23,932 (12)	6651 (18.6)	1462 (0.327)	20,476 (63.5)	170,611 (87.6)	0.0	0.0
Religion										
Muslims	689 (3.91)	255 (0.152)	1458 (10.4)	11,341 (11.9)	3763 (24.1)	870 (0.653)	8724 (61.7)	79,096 (87.2)	0.0	0.0
Hindus	3765 (4.45)	568 (0.109)	9279 (11.6)	52,668 (10.5)	16,615 (20)	3529 (0.667)	50,470 (63.9)	447,503 (88.8)		
Christians	628 (5.09)	301 (0.14)	787 (12)	6381 (13.2)	2693 (22.9)	2068 (0.997)	3059 (60)	40,764 (85.6)		
Others	271 (3.11)	102 (0.053)	966 (18.8)	4882 (13.5)	761 (10.9)	318 (0.25)	3119 (67.2)	26,967 (86.2)		
Age										
15-29 years	873 (10.2)	125 (0.202)	1033 (12.1)	17,332 (4.6)	482 (5.67)	1468 (0.214)	6110 (71.8)	331,584 (95.2)	0.0	0.0
30-39 years	2598 (3.48)	361 (0.11)	7084 (9.49)	24,225 (12.7)	15,480 (20.7)	2174 (0.759)	49,464 (66.2)	155,239 (86.4)		
>40 years	1852 (7.65)	740 (0.339)	4312 (17.8)	33,715 (23.1)	8234 (34.03)	3143 (1.58)	9798 (40.4)	107,507 (75)		
Caste										
ST	1074 (4.55)	448 (0.245)	1633 (11.2)	11,920 (11)	4536 (22.1)	2712 (1.24)	7758 (62.2)	83,374 (87.5)	0.0	0.0
SC	3877 (4.28)	635 (0.103)	101,84 (11.8)	58,726 (10.7)	17,395 (19.9)	3659 (0.618)	54,222 (64)	483,524 (88.6)		
Others	369 (5.62)	141 (0.141)	612 (9.54)	4409 (13.5)	1795 (27.1)	392 (0.646)	3167 (57.8)	25,556 (85.7)		
Socioeconomic status										
Poorest	765 (4.1)	280 (0.228)	1352 (7.33)	11,926 (9.02)	4749 (27)	1998 (1.59)	10,881 (61.5)	115,605 (89.2)	0.0	0.0
Poor	1134 (4.22)	338 (0.168)	1939 (8.28)	14,817 (9.64)	5843 (24.4)	1736 (0.889)	13,389 (63.1)	128,480 (89.3)		
Middle	1261 (4.93)	263 (0.082)	2538 (11.1)	15,635 (10.3)	5452 (20.8)	1401 (0.481)	14,019 (63.4)	125,404 (89.1)		
Rich	1220 (4.93)	223 (0.069)	3047 (14)	16,502 (12.2)	4479 (17.7)	1068 (0.279)	13,435 (63.4)	116,166 (87.4)		
Richest	973 (3.73)	122 (0.040)	3614 (15.7)	16,392 (12.6)	3309 (14.7)	582 (0.198)	13,648 (65.9)	108,675 (87.1)		
Education										
No formal education	1067 (7.27)	753 (0.318)	1503 (9.98)	26,683 (13.8)	4796 (33.6)	3897 (1.85)	7020 (49.1)	160,198 (84.1)	0.0	0.0
Primary	950 (6.4)	183 (0.086)	1518 (12)	11,347 (13.1)	4345 (29.4)	1013 (0.522)	6960 (52.1)	73,471 (86.3)		
Secondary	2779 (3.68)	268 (0.027)	6830 (11.1)	30,806 (9.3)	12,466 (17.7)	1678 (0.138)	40,232 (67.5)	290,971 (90.5)		
Higher	557 (2.86)	22 (0.0174)	2639 (14.7)	6436 (7.89)	2225 (12.2)	197 (0.127)	11,160 (70.2)	69,690 (92)		
Marital status										
Never married	661 (1.21)	70 (0.019)	2370 (5.82)	7009 (3.64)	5798 (13.3)	607 (0.127)	29,289 (79.7)	156,718 (96.2)	0.0	0.0
Married	4526 (5.97)	1028 (0.13)	9928 (14.9)	63,268 (12.6)	17,481 (23.9)	5517 (0.77)	35,423 (55.2)	416,046 (86.5)		
Others (divorced, separated, widowed)	166 (9.85)	128 (0.32)	192 (11.3)	4995 (18)	553 (33.6)	661 (1.56)	660 (45.2)	21,566 (80.1)		
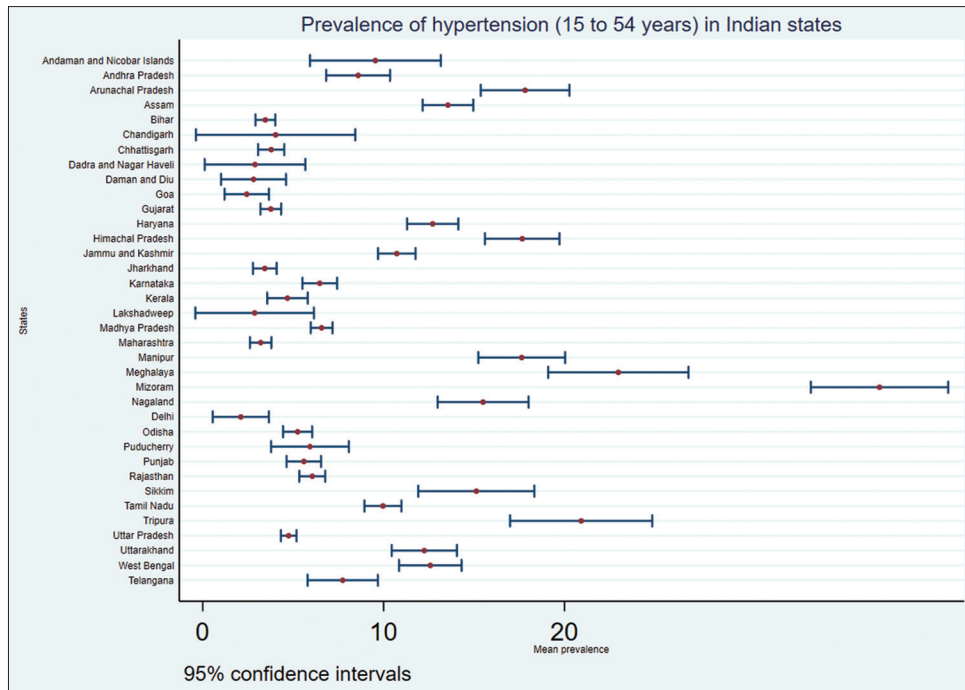
Figure 1: Proportion (with confidence intervals) of hypertensives among tobacco smoking males (15–54 years) in Indian states
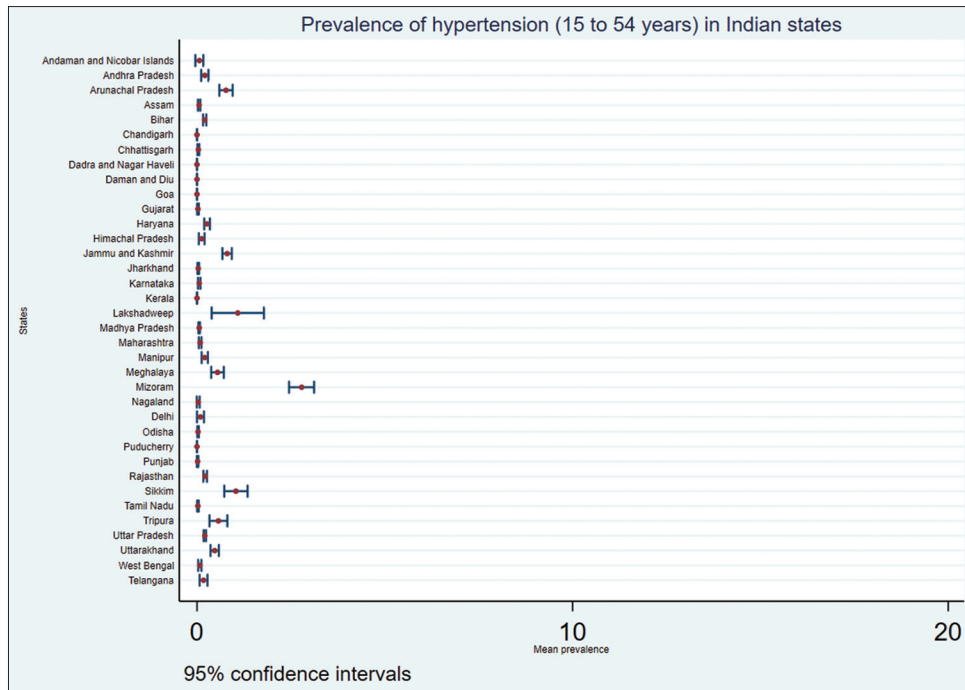
Figure 2: Proportion (with confidence intervals) of hypertensives among tobacco smoking females (15–54 years) in Indian states

in Korea.[23] Also, both DM and HTN share common risk factors such as obesity and insulin resistance as per the literature and lead to cardiovascular morbidity through a similar mechanism.[27,28] Obese males were found to be at 3.7 times increased odds for HTN and obese females had an OR of 3.16 for HTN.[29,30]

This study found that in urban areas, 4.55% of males and 0.66% of females were smokers and hypertensives. Whereas in rural areas, 4.24% of males and 0.138% of females were smokers and hypertensives. But the percentage of smokers was more in rural areas (25.6% males, 0.97% females) compared to urban areas (23.1% males, 0.98% females), whereas the percentage of hypertensives was more in urban areas (17.95 males, 12.66% females) than rural areas (14.84% males, 10.33% females), which can be due to other factors such as stress or lifestyle changes in urban areas. Global adult tobacco survey (GATS-2) survey also

Smoking products	Responses	Hypertensives females		Hypertensive males	
		Unadjusted odds ratio (with 95% CI)	*P*	Unadjusted odds ratio (with 95% CI)	*P*
Cigarette	No	Reference	0.03	Reference	0.001
	Yes	1.50 (1.03-2.19)		1.15 (1.06-1.25)	
Pipe	No	Reference	<0.001	Reference	0.08
	Yes	2.26 (1.38-3.71)		1.58 (0.94-2.66)	
Cigars	No	Reference	0.183	Reference	0.02
	Yes	1.31 (0.88-1.94)		1.53 (1.06-2.20)	
Hookah	No	Reference	0.003	Reference	0.02
	Yes	1.38 (1.11-1.70)		1.33 (1.05-1.69)	
Bidi	No	Reference	<0.001	Reference	<0.001
	Yes	1.34 (1.17-1.52)		1.14 (1.07-1.22)	

Table 2: Findings from univariate logistic regression for the association of smoking with elevated blood pressure among Indians (15-54 years)

CI=Confidence interval

revealed the prevalence of smoking to be higher in rural areas.[7] This can be attributed to the fact that tobacco cultivation and bidi rolling employ most of the people in rural areas, which may pose them at increased risk. It is a challenge to address this issue without affecting their livelihood. The study also found smokers having HTN were more among those who were divorced/widowed (9.85% males, 0.32% females) compared to those who were married (5.97% males, 0.13% females) or never married (1.21% males, 0.019% females). This can be attributed to loneliness, societal pressure, or depression faced by those who were separated or widowed.

Though this study could not find any significant association of tobacco smoking with HTN on the multivariable model after adjusting for confounding factors and other variables, the study findings highlight the significant association of smoking of various tobacco products with HTN in both men and women on univariate analysis. Cigarette smoking was found to have OR of 1.50 (CI: 1.03–2.19) in females and 1.15 (CI: 1.06–1.25) in males. Smoking pipes were found to be at 2.26 (CI: 1.38–3.71) times higher risk for HTN in females and not in males. Smoking cigars was not significantly associated with HTN in females, but had an OR of 1.53 (CI: 1.06–2.20) in males. Hookah had an OR of 1.38 (CI: 1.11–1.70) in females and 1.33 (CI: 1.05–1.69) in males. Bidi smoking was associated with 1.34 (CI: 1.17–1.52) times higher risk for HTN in females and 1.14 (CI: 1.07–1.22) higher risk in males. Interestingly, this study found that smoking tobacco products 30 min before measuring BP had 1.23 (CI: 1.14–1.32) times higher odds of having HTN in males and 1.23 (CI: 1.13–1.35) times higher odds for HTN in females. Cigarette smoking 30 min before measurement of BP was found to have 1.23 times higher odds for HTN in males and 1.12 times higher odds in females.

A study in the USA has shown that nicotine concentration of tobacco is higher in bidi compared to that in filtered and unfiltered commercial cigarettes, posing those who smoke bidi with increased health issues and tobacco dependence.[31] In this study, adjusted elevated BP with bidi smokers was 0.85 (CI: 0.78–0.92) times lower in males and 0.81 (CI: 0.70–0.94)

times lower in females compared to non-bidi smokers and the association was statistically significant. Though smoking bidis repeatedly produce an immediate temporary rise in BP, evidence of elevated BP among the steady smokers needs further research. Though the survey data is highly representative of the population and offers many advantages, it is not free of human errors during the data collection process. Hence, the finding that bidi smoking has a lower risk for HTN may be a spurious association impacted by the quality of data collected.

The main strength of the study is that its sample is representative of the general population aged 15–54 years, and this study is the first of its kind to show the individual association of different products of tobacco smoking (i.e., cigarette, pipe, cigars, hookah, and bidis) with mean elevated BP. The major limitation of this study is the absence of duration of smoking in the survey data. Also, it is a cross-sectional study and the data do not allow conclusions about causal relationships.

Programmatic Implications and Recommendations

Implementation of national tobacco control program should be extended to every district at the earliest; it can also be decentralized to taluk and village levels and a tobacco control cell can be established at each of these levels. The study finding that 8.39% of males and 0.2% of females in the age group of 15–18 years smoked tobacco suggests the need for strict legislation or punishment for those who promote the sale of tobacco to minors. Bidi is the most common form of tobacco used for smoking. Hence, taxation on bidi should be increased. Since rural areas is more involved, coverage of the program should be evaluated separately in rural areas.

Qualitative research shall be conducted to understand the perceptions of rural people about tobacco smoking and to understand the reach of awareness material on them and the factors that influence their decision. This will help us better in changing the attitude of people toward tobacco smoking. Cohort studies are needed to explore and understand the chronic effect of smoking on BP. Quality data collected through a large-scale survey on secondhand smoke exposure at respondents' homes,

Table 3: Association between tobacco smoking and hypertension in India using multivariable logistic regression models

Risk factors	Categories	aOR (95% CI)	
		Males	Females
Sociodemographic characters			
Age	15-29 years	Reference	Reference
	30-39 years	1.95 (1.79-2.15)	2.39 (2.32-2.47)
	40 years and above	3.47 (3.17-3.80)	4.59 (4.44-4.75)
Education	No education		Reference
	Primary	1.11 (1.01-1.23)	1.01 (0.98-1.05)
	Secondary	1.04 (0.96-1.12)	0.90 (0.87-0.93)
	Higher	1.18 (1.06-1.32)	0.79 (0.74-0.83)
Wealth index	Poorest	Reference	Reference
	Poor	0.99 (0.91-1.08)	0.96 (0.92-1.00)
	Middle	1.20 (1.10-1.32)	0.97 (0.93-1.01)
	Rich	1.35 (1.22-1.49)	1.07 (1.02-1.12)
	Richest	1.20 (1.07-1.34)	1.02 (0.97-1.07)
Marital status	Unmarried	Reference	Reference
	Married	1.28 (1.17-1.41)	1.40 (1.34-1.47)
	Separated/widowed	1.37 (1.09-1.73)	1.50 (1.40-1.60)
Smoking			
Cigarette	No	Reference	Reference
	Yes	0.95 (0.87-1.04)	1.18 (0.78-1.79)
Pipes	No	Reference	Reference
	Yes	1.22 (0.75-2.01)	1.39 (0.81-2.38)
Cigar	No	Reference	Reference
	Yes	1.18 (0.79-1.76)	0.91 (0.60-1.38)
Hookah	No	Reference	Reference
	Yes	1.05 (0.81-1.36)	0.90 (0.72-1.12)
Bidi	No	Reference	Reference
	Yes	0.85 (0.78-0.92)	0.81 (0.70-0.94)
Confounding factors			
Smoked tobacco products before 30 min of BP measurement	No	Reference	Reference
	Yes	1.19 (1.09-1.29)	1.20 (1.14-1.27)
Cigarette taken 30 min before BP measurement	No	Reference	Reference
	Yes	1.23 (1.14-1.32)	1.23 (1.13-1.35)
Coffee drinking before 30 min of BP measurement	No	Reference	Reference
	Yes	1.23 (1.15-1.33)	1.12 (1.08-1.15)
Eaten before 30 min of BP measurement	No	Reference	-
	Yes	0.90 (0.84-0.96)	
Physical characteristic			
BMI	Undernutrition	Reference	Reference
	Normal	1.70 (1.57-1.85)	1.39 (1.34-1.44)
	Overweight/obese	3.70 (3.36-4.08)	3.01 (2.89-3.14)
History of illness and addiction			
Diabetes	No	Reference	Reference
	Yes	1.80 (1.53-1.12)	0.53 (0.50-0.58)
	Don't know status	1.02 (0.78-1.33)	0.56 (0.49-0.63)
Alcohol intake	No	Reference	Reference
	Yes	1.36 (1.27-1.45)	1.27 (1.17-1.38)

aOR=adjusted odds ratio, BMI=body mass index, BP=blood pressure

workplaces, or any other potential space may help to generate evidence for future perspectives. Further, thirdhand smoke is another significant research priority.

Conclusion

Cigarette smoking is a modifiable factor in the development and progression of HTN. Hence, it is important to run a comprehensive antitobacco campaign, which focuses on individual-based behavioral and pharmacological interventions to fight nicotine addiction and community-level measures. Though this study could not find any significant association between smoking tobacco and adjusted BP, one cannot ignore the harmful effects of tobacco. Adequate preventive and promotive health measures targeting the young and poorer sections of society may help in reducing the consumption of tobacco. The proportion of smokers was found to be significantly higher in rural India. Hence, measures should be taken to reduce demand by increasing taxation on tobacco products and reduce the cultivation of tobacco and ensure alternate farming for tobacco

growers in line with the World Health Organization (WHO) framework for tobacco convention, which will help in the long run.

Conflicts of interest

There are no conflicts of interest.

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