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SOCIO-DEMOGRAPHIC PATTERNS OF HYPERTENSION AND ITS ASSOCIATION WITH TOBACCO USE IN NEPAL: EVIDENCE FROM THE COUNTRY REPRESENTATIVE DEMOGRAPHIC AND HEALTH SURVEY

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ABSTRACT

Introduction: *Cardiovascular diseases (CVDs) account for a third of global deaths, with growing burdens in South Asia. Hypertension is a leading modifiable CVD risk factor, and tobacco use—smoked and smokeless—remains common in Nepal. We examined the association between tobacco use and hypertension and described sociodemographic patterns of hypertension using nationally representative data.*

Methods: *We analysed Nepal Demographic and Health Survey (NDHS) 2016 data, as the data of 2022 were not available while requesting the data access through DHS and drafting this manuscript in late 2022 to early 2023. For prevalence by sociodemographic characteristics (age, province, ecological zone, residence, education, wealth), we included 10,470 adults aged 15–49 years with valid blood pressure (BP) measures (6,364 women; 4,106 men). For tobacco–hypertension associations, 40 participants lacked tobacco data; thus, analyses used 10,430 individuals (6,344 women; 4,086 men). BP was measured three times with validated devices; the mean of the second and third readings defined categories (normal, pre-hypertension, Stage 1–3). Hypertension was SBP ≥140 mmHg and/or DBP ≥90 mmHg or antihypertensive use. We employed descriptive statistics and Chi-square tests and logistic regression for the association of hypertension with any tobacco use ($p<0.01$).*

Results: *Hypertension prevalence was 16.8% in women and 23.4% in men, rising steeply with age. Urban residents exceeded rural, and the Hill ecological zone exceeded the Mountain and Terai. By province, burdens were highest in Gandaki and Bagmati. An inverse educational gradient (highest in no schooling) contrasted with a wealth gradient (highest in the richest quintile).*

Tobacco use was associated with higher hypertension in both sexes: among women, 15.8% of users versus 9.9% of non-users; among men, 19.9% versus 13.3% (both p<0.01). BP distributions shifted from normal to pre-hypertension and Stage 1–2 among users.
Conclusion: *In Nepal, tobacco use is significantly associated with higher prevalence and severity of hypertension across diverse sociodemographic strata. Integrating tobacco cessation into hypertension detection and control—alongside salt reduction, physical activity, healthy weight, reduced alcohol, and cleaner air—should be prioritised. Future multivariable and longitudinal studies should disentangle tobacco form, intensity, and confounding to refine CVD prevention.*

KEYWORDS: *Tobacco Use, Cardiovascular Diseases, Hypertension, Demographic and Health Survey, Asia, Nepal*

INTRODUCTION

Cardiovascular diseases (CVDs) are responsible for about 32% of all deaths worldwide each year, with the highest rates of CVDs found in countries in South Asia (Gaziano, 2022; Raheem et al., 2022; Zhao, 2021). Out of all CVD deaths globally, over 80% are caused by heart attacks and strokes, and a significant portion of these deaths occur prematurely in individuals under the age of 70 (Ferrari et al., 2021; Mensah et al., 2023). Cardiovascular diseases, also known as CVDs, encompass a range of disorders affecting the heart and blood vessels. These include conditions such as coronary heart disease, cerebrovascular disease, and rheumatic heart disease, among others (Castaneda et al., 2016; Wiseman et al., 2016).

According to the World Health Organisation (WHO), systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg on two different days is called hypertension (WHO, 2023). It is the leading risk factor for cardiovascular diseases (CVDs). It significantly increases the likelihood of developing heart, brain, kidney, and other health issues (Mavrogeni et al., 2022; Mensah et al., 2002; Meissner, 2016). Hypertension, a complex condition linked to several cardiovascular diseases, is becoming a significant risk factor for young people as it progresses (Gooding et al., 2020; Steinberger et al., 2009). Hypertension has several risk factors, both modifiable and non-modifiable. Modifiable risk factors include an unhealthy diet, lack of physical activity, smoking, and excessive alcohol consumption, as well as obesity (Mayega et al., 2012; Samadian et al., 2016). Non-modifiable risk factors include a family history of hypertension, being over the age of 65, and having coexisting conditions such as diabetes and chronic kidney disease (Bozkurt et al., 2016; Palliyaguruge Abeywickrama & Niranji, 2024; Ranasinghe et al., 2015).

Hypertension and the consumption of tobacco are the leading causes of preventable deaths worldwide. Smoking cigarettes temporarily raises the heart rate and blood pressure, and negatively impacts the heart's ability to contract (Prasad et al., 2010; WHO, 2020). Smoking actively can have harmful effects on the smoker themselves, but exposure to secondhand smoke can also harm those who do not smoke, such as innocent bystanders

(Adhami et al., 2016). It is well-known that smoking can increase blood pressure as we age. This increase is caused by a combination of various factors, including not only ageing but also unique environmental and lifestyle factors (Neaton & Wentwort, 1992; Omvik, 1996). Smoking contributes to air pollution, and numerous epidemiological studies have shown that exposure to air pollution can lead to an increase in cardiovascular disease and death. It is believed that changes in blood pressure may play a role in this association (Al-Kindi et al., 2020; Aryal et al., 2022; Franklin et al., 2015; Lee et al., 2014).

In Nepal, it is estimated that approximately 27,100 deaths each year, which is roughly 14.9% of all deaths, are caused by illnesses related to the use of tobacco (WHO, 2018). The use of tobacco has led to an increase in hypertension in Nepal (Lan et al., 2021). The prevalence of hypertension in Nepal varies among genders and different provinces. It is found to be twice as common among men aged 30–34 years (21%) compared to women of the same age group (10%) (NDHS, 2016). Factors such as the education level of a person's partner, the medical history of their parents, and their weight (specifically, if they are obese) play a significant role in the prevalence of hypertension (Thapa et al., 2022). In Nepal, the rate of tobacco consumption among boys aged 13 to 15 was reported to be higher than that of girls. Among individuals between the ages of 15 and 69, 28.9% reported regularly using tobacco in any form (48.3% men; 11.6% women). Additionally, 17.1% of adults—about 2.8 million individuals—were currently smoking tobacco (28.0% men; 7.5% women) (WHO, 2018).

While CVDs remain the leading cause of death worldwide, limited studies are available on the linkage of CVDs with tobacco consumption in developing countries such as Nepal. Therefore, this study aims to identify the existing situation of tobacco use and its association with hypertension—as a key risk factor for cardiovascular diseases—in the context of a developing country with special reference to South Asia, by analysing nationally representative DHS 2016 data of Nepal. In line with current evidence and Nepal's epidemiological profile, we describe the distribution of hypertension by age, province, ecological zone, residence, education and wealth, and examine the association between any tobacco use and hypertension.

METHODS

Study sites: Nepal is a landlocked country. It lies on the southern face of the Himalayan mountain range, located between China in the north and India on three sides: east, west and south. Its total land area is 147,516 square kilometres (km²), and it lies between latitudes of 26°22' to 30°27' North and longitudes 80°04' to 88°12' East. Nepal has three broad ecological regions: Tarai (17%), Hill (62%) and Mountain (21%). Nepal is divided into 77 districts and seven administrative provinces. In the federal system of the country, provinces are further subdivided into local governance units (i.e., municipal and village councils) (Pradhan, 2017). Selected districts of Nepal, as covered by the Nepal

Demographic and Health Survey (NDHS) 2016, were considered for this study.

Data source and design: Given that the 2022 NDHS data were unavailable at the time of data access and writing (late 2022–early 2023), we conducted our analyses using the 2016 NDHS, a country-representative cross-sectional study (MoHP et al., 2017), conducted by the Ministry of Health in collaboration with the United States Agency for International Development as part of the global DHS Program. The survey includes women and men aged 15–49 years, and the NDHS biomarker module obtained blood pressure measurements among individuals aged 15 years and older. The survey used stratified multistage cluster sampling in 14 strata sampled from rural and urban areas across the seven provinces. Wards were the key sampling units in each stratum. Probability proportional to size was used to select units. The study divided the 383 PSUs into 30 equal-probability groups to select households (MoHP, 2017).

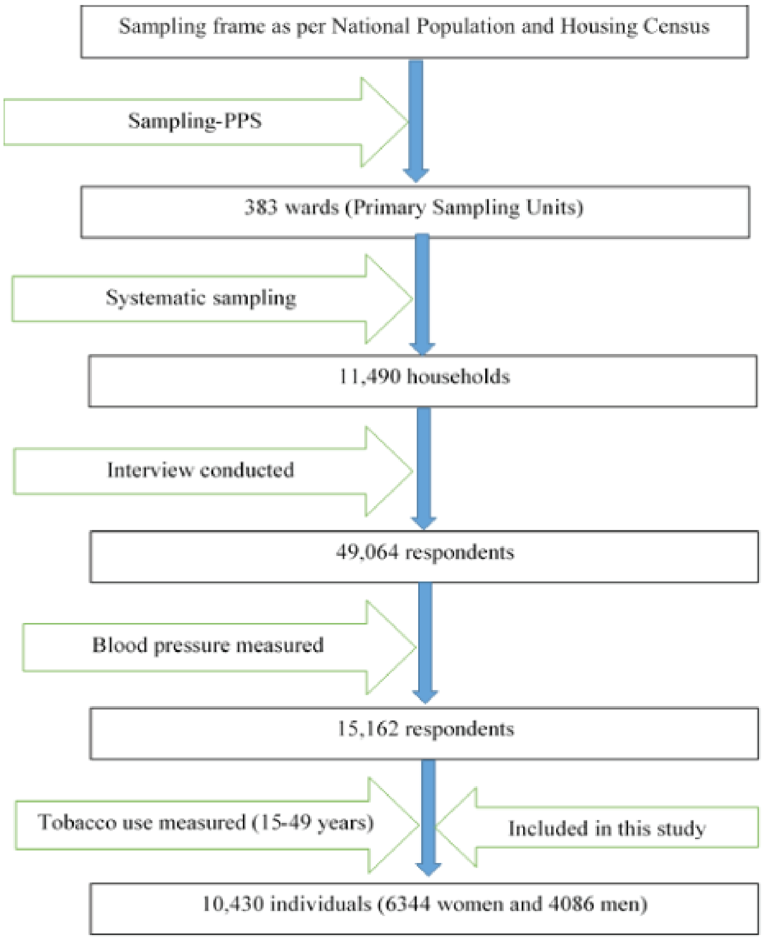

Figure 1. Process of selection of study participants

Study population and sample: For the results presented in Tables 1 and 2, we analysed NDHS 2016 data on **10,470** adults (6,364 women and 4,106 men) aged 15–49 years for whom hypertension was measured. For twenty women and twenty men, data on tobacco use were unavailable. Therefore, analyses of the association between tobacco use and hypertension (Tables 3–6) were conducted among 10,430 individuals (6,344 women and 4,086 men). This analytic split preserves comparability of prevalence estimates by sociodemographic characteristics (Tables 1–2) and maximises available data for tobacco–hypertension associations (Tables 3–6).

Variables of the study: Hypertension—measured in NDHS 2016 as the immediate risk factor for CVD—was the dependent variable. Independent variables included age, sex, province, ecological zone (Mountain, Hill, Terai), place of residence (urban/rural), ethnicity, occupation, education level, household wealth quintile, and any tobacco use.

Measurement of blood pressure: Blood pressure was assessed in participants aged 15 years and older using validated UA-767F/FAC automated monitors during individual interviews. Three sequential readings were obtained at intervals of at least five minutes, and the mean of the second and third measurements was used for hypertension classification in accordance with WHO (1999) and NIH (1997) criteria. Participants were subsequently provided with their results alongside educational materials on hypertension symptoms and preventive strategies.

Hypertension definition: Participants were identified as hypertensive if systolic pressure was ≥140 mmHg and/or diastolic pressure ≥90 mmHg, or if they reported current use of antihypertensive medication despite lower readings. Those with systolic values between 120–139 mmHg and/or diastolic values between 80–89 mmHg were categorised as pre-hypertensive (NIH, 2004). Hypertension severity was further stratified into stage 1 (140–159/90–99 mmHg), stage 2 (160–179/100–109 mmHg), and stage 3 (≥180/≥110 mmHg) following WHO (1999) thresholds.

Data analysis: The data analysis process incorporated descriptive and inferential statistics. We described the prevalence of hypertension across age groups, provinces, ecological zones, residence (urban/rural), education, and wealth quintiles (Tables 1–2). We then examined the association of hypertension with any tobacco use using the Chi-square test (Tables 3–6). Statistical significance was assessed at $P < 0.05$ (two-sided). The outcomes were presented as prevalence percentages with 95% confidence intervals where applicable. Data were analysed using IBM SPSS version 20 (IBM Corp., Armonk, N.Y., USA).

Ethical approval: Before the execution of the NDHS 2016 survey, the Inner City Fund (ICF) International Institutional Review Board and the Nepal Health Research Council (NHRC) cleared the protocol. In advance of the interviews for NDHS, written informed consent was obtained from respondents. For this study, the DHS Program granted access to the NDHS 2016 SPSS dataset to the corresponding author, and ethical considerations were followed throughout.

RESULTS

Background characteristics of the respondents

The findings yielded from the analysis of data encompass the background socio-demographic characteristics of respondents, the association of tobacco use with sociodemographic variables, and the effect of tobacco use on the risk of CVD.

The background characteristics of the respondents constitute socio-demographic characteristics such as age group, ethnicity, education level, religion, province, place of residence (urban/rural), and wealth quintile.

Table 1. Prevalence of hypertension by socio-demographic characteristics of women (aged 15-49 years)

Background characteristic	Prevalence of hypertension	Number of women
Age		
15-29	4.1	3,436
15-19	2.9	1,260
20-24	3.2	1,176
25-29	6.7	999
30-44	15.6	2,408
30-34	9.8	933
35-39	16.6	813
40-44	22.4	662
45-69	32.6	2,161
45-49	27.9	522
50-54	27.5	533
55-59	32.2	430
60-64	39.2	389
65-69	42.0	287
70+	46.0	430
15-69	15.2	8,005
Residence		
Urban	17.2	5,153
Rural	16.2	3,282
Ecological		
Mountain	16.6	526
Hill	18.5	3,729
Terai	15.3	4,180
Province		
Koshi	17.7	1,479
Madhesh	13.1	1,699
Bagmati	19.1	1,789
Gandaki	23.8	877
Lumbini	18.8	1,406
Karnali	10.1	440

Sudurpashchim	10.2	744
Education		
No education	23.6	4,009
Primary	15.0	1,158
Some secondary	9.2	1,655
SLC and	9.1	1,608
Wealth quintile		
Lowest	14.9	1,540
Second	16.9	1,678
Middle	14.2	1,743
Fourth	14.6	1,808
Highest	23.6	1,667
Total	**16.8**	**8,435**

Among women, the overall prevalence of hypertension was 16.8% (N = 8,435). Prevalence rose steeply with age: 2.9% at 15–19 years, 3.2% at 20–24, 6.7% at 25–29, 9.8% at 30–34, 16.6% at 35–39, 22.4% at 40–44, and 27.9% at 45–49; in the older bands listed in the table, prevalence reached 39.2% (60–64) and 46.0% (≥70).

Geographically, urban women had slightly higher hypertension than rural women (17.2% vs. 16.2%). Across ecological zones, the Hill region had the greatest burden (18.5%), followed by the Mountain (16.6%) and the Terai (15.3%). By province, prevalence was highest in Gandaki (23.8%), followed by Bagmati (19.1%), Lumbini (18.8%), and Koshi (17.7%), and lowest in Karnali (10.1%) and Sudurpashchim (10.2%); Madhesh was 13.1%.

Socioeconomic gradients were pronounced. Hypertension was highest among women with no education (23.6%), substantially lower among those with primary (15.0%) and some secondary (9.2%) schooling, and lowest among those with SLC and above (9.1%). By wealth, prevalence peaked in the highest quintile (23.6%) versus 14–17% in the other quintiles.

Overall, hypertension among women displays a clear age gradient and a geographic concentration in urban areas, the Hill ecological zone, and particularly Gandaki Province. The pattern also indicates higher prevalence with lower education yet higher prevalence in the richest households, suggesting that behavioural and environmental exposures linked with urbanisation and affluence (e.g., diet, sedentary work) may coexist with education-related protective effects; these deserve exploration in multivariable analyses.

Table 2. Prevalence of hypertension by socio-demographic characteristics of men (aged 15-49 years)

Background characteristic	Prevalence of hypertension	Number of men
Age		
15-29	7.1	2,117
15-19	2.5	949

20-24	8.4	635
25-29	13.6	532
30-44	25.1	1,562
30-34	21.1	557
35-39	26.1	541
40-44	28.7	465
45-69	35.3	1,915
45-49	34.6	427
50-54	29.5	462
55-59	36.3	404
60-64	39.2	337
65-69	39.8	284
70+	43.1	466
15-69	21.8	5,593
Residence		
Urban	25.2	3,741
Rural	20.5	2,318
Ecological		
Mountain	18.0	378
Hill	28.0	2,645
Terai	20.1	3,037
Province		
Koshi	20.8	1,075
Madhesh	17.6	1,276
Bagmati	28.7	1,357
Gandaki	30.7	616
Lumbini	24.9	974
Karnali	21.8	293
Sudurpashchim	18.2	468
Education		
No education	27.6	1,449
Primary	26.2	1,231
Some secondary	19.1	1,656
SLC and	21.9	1,717
Wealth quintile		
Lowest	21.4	1,062
Second	23.1	1,133
Middle	19.4	1,175
Fourth	20.9	1,375
Highest	31.5	1,315

Total		23.4	6,059

Among men, the overall prevalence of hypertension was 23.4% (N = 6,059). As with women, prevalence increased sharply with age: 2.5% at 15–19 years, 8.4% at 20–24, 13.6% at 25–29, 21.1% at 30–34, 26.1% at 35–39, 28.7% at 40–44, and 34.6% at 45–49; in the older bands listed, prevalence reached 39.2% (60–64) and 43.1% (≥70).

Urban men had substantially more hypertension than rural men (25.2% vs. 20.5%). By ecological zone, Hill men had the highest prevalence (28.0%) compared with Terai (20.1%) and Mountain (18.0%). By province, hypertension was highest in Gandaki (30.7%) and Bagmati (28.7%), followed by Lumbini (24.9%) and Karnali (21.8%); lower prevalences were observed in Koshi (20.8%), Sudurpashchim (18.2%), and Madhesh (17.6%).

Socioeconomic patterns were mixed but showed a consistent wealth effect. Prevalence was highest among men with no education (27.6%) or primary education (26.2%), lower among those with some secondary (19.1%), and 21.9% among those with SLC and above. By wealth, the highest quintile had the greatest prevalence (31.5%) versus ~19–23% in other quintiles.

Men show higher overall levels of hypertension than women and a pronounced urban/ Hill/provincial concentration (notably Gandaki and Bagmati). As in women, a strong age gradient is evident. Education relates inversely (highest at no/primary education), while wealth is positively associated (peak in the richest quintile), pointing to potentially different mixes of behavioural risk, health service contact, and lifestyle across socioeconomic strata.

Tobacco products used for smoking

Both smoked products include cigarettes, bidi (rolled tobacco), hookah (nargileh), sulfa and chillum or kankad, and smokeless products like surti (dry tobacco leaves), khaini (lime-mixed tobacco), gutkha (areca nut) and paan (beetle quid) with tobacco ingredients are produced in Nepal (GoN, 2010).

Use of Tobacco products and hypertension as a risk of CVD among women and men

The status of blood pressure and tobacco use was assessed among men and women. The findings have been given in Tables 3 & table 4.

Table 3. Blood pressure status by tobacco use among women (15-49 years)

Measures	Prevalence of hypertension	Normal (optimal)	Normal (pre-hypertensive)	Hypertensive			Total	Number of women
		SBP <120 mmHg/ DBP <80 mmHg	SBP 120-139 mmHg/ DBP 80-89 mmHg	Stage 1: SBP 140-159 mmHg/ DBP 90-99 mmHg	Stage 2: SBP 160-179 mmHg/ DBP 100-109 mmHg	Stage 3: SBP ≥180 mmHg/ DBP ≥110 mmHg		

Uses tobacco products	15.8	60.3	24.5	10.2	3.7	1.3	100	565
Does not use tobacco products	9.9	69.3	21.6	6.9	1.8	0.4	100	5779
Total 15-49	**10.4**	**68.5**	**21.8**	**7.2**	**2.0**	**0.5**	**100**	**6344**

Using standard categories (normal <120/80; pre-hypertension 120–139/80–89; Stage 1: SBP 140–159 or DBP 90–99; Stage 2: SBP ≥160 or DBP ≥100; and "hypertensive" as Stage 1+Stage 2 combined), women who used tobacco had a higher combined prevalence of hypertension than non-users (15.8% vs. 9.9%). Tobacco-using women also had fewer normal readings (60.3% vs. 67.4%), more pre-hypertension (24.5% vs. 22.6%), and higher Stage 1 (10.2% vs. 7.2%) and Stage 2 (5.6% vs. 2.6%) proportions. This means among women, tobacco use shifts the distribution away from normal BP toward pre-hypertension and hypertension (both Stage 1 and Stage 2).

Table 4. Blood pressure status by tobacco use among men (15-49 years)

Measures	**Prevalence of hypertension**	**Normal (optimal)**	**Normal (pre-hypertensive)**	**Hypertensive**			**Total**	**Number of men**
		SBP <120 mmHg/ DBP < 80 mmHg	SBP 120-139 mmHg/ DBP 80-89 mmHg	Stage 1: SBP 140-159 mmHg/ DBP 90-99 mmHg	Stage 2: SBP 160-179 mmHg/ DBP 100-109 mmHg	Stage 3: SBP ≥180 mmHg/ DBP ≥ 110 mmHg		
Use of tobacco products	19.9	49.7	31.1	13.0	4.7	1.6	100	2158
No use of tobacco products	13.3	56.4	31.6	9.0	2.4	0.6	100	1928
Total 15-49	**16.8**	**52.8**	**31.3**	**11.1**	**3.6**	**1.1**	**100**	**4086**

A similar pattern was observed in men. Compared with non-users, male tobacco users had higher combined hypertension (19.9% vs. 13.3%), with fewer normal readings (56.2% vs. 64.6%), more pre-hypertension (24.0% vs. 22.1%), and higher Stage 1 (13.0% vs. 9.0%) and Stage 2 (6.9% vs. 4.3%) hypertensive proportions.

Association of hypertension with the use of tobacco among women and men

Table 5. Association of use of tobacco with hypertension among women (15-49 years)

Tobacco Use	Status of hypertension among women		P-value
	Hypertension (%)	No Hypertension (%)	
Yes	89 (15.8%)	476 (84.2%)	<0.01
No	572 (9.9%)	5207 (90.1%)	

Sixteen per cent of women using tobacco were found to be hypertensive, while only ten per cent of women not using tobacco were hypertensive. Chi-square test and bivariate logistic regression revealed that hypertension among women was significantly associated with the use of tobacco (P<0.01), corroborating the descriptive patterns in Table 3.

Table 6. Association of use of tobacco products with hypertension among men (15-49 years)

Tobacco Use	Status of hypertension among men		P-value
	Hypertension (%)	No Hypertension (%)	<0.01
Yes	429 (19.9%)	1729 (80.1%)	
No	256 (13.3%)	1672 (86.7%)	

Twenty per cent of men using tobacco were found to be hypertensive, and only thirteen per cent of men who were not using tobacco were found to be hypertensive. Hypertension among men was significantly associated with the use of tobacco (P<0.01). Chi-square test and bivariate logistic regression demonstrated significant associations between tobacco use and hypertension status in men (p < 0.01), corroborating the descriptive patterns in Table 4.

DISCUSSION

This study found that tobacco use was significantly associated with hypertension among Nepali adults. In the nationally representative NDHS 2016 data, 16% of women and 20% of men who used any form of tobacco were hypertensive, compared to only 10% of women and 15% of men who did not use tobacco. Logistic regression confirmed that the odds of hypertension were significantly higher in tobacco users (P<0.01). These findings suggest that tobacco use contributes to elevated blood pressure and cardiovascular risk in Nepal.

Several international studies are consistent with a positive link between smoking and hypertension. For example, a recent large Japanese cohort reported that sustained smokers had a higher incidence of new-onset hypertension than non-smokers (multivariable-adjusted HR ≈1.34) (Yamato et al. 2025). Likewise, some prospective Western studies (e.g. older UK men and men in France) also found higher blood pressure or greater hypertension incidence in smokers (Modesti et al., 2016; Primatesta et al., 2001; Renaud et al., 2004; Vallee, 2023; Wolf-Maier et al., 2003). These results align with our finding that smokers in Nepal have increased hypertension risk. In contrast, however, many epidemiological studies have observed no association or even lower blood pressure among smokers. In Nepal, Lan et al. (2021) found that daily female smokers actually had lower systolic and diastolic blood pressure than non-smokers after adjustment, and no association in men. In China, a cross-sectional study reported that current smokers had lower adjusted SBP and DBP compared to nonsmokers, and smoking was not a risk factor for hypertension (Li et al. 2017; Zhang et al., 2021). A recent review also highlights this paradox: observational data often show current smokers having a lower prevalence of hypertension than non-smokers, despite heavier smoking showing a modest dose-response increase in risk (Astori et al., 2022; Jareebi et al., 2024; Smith et al., 2000; WHO, 2002). These inconsistencies suggest that simple cross-sectional analyses may be confounded by factors like body weight, age of smoking initiation, or other lifestyle variables.

In summary, the literature on smoking and blood pressure is mixed based on the study design. Some longitudinal studies (e.g. Japan, France) and clinical guidelines imply smoking raises cardiovascular risk, but some large surveys find no independent increase in blood pressure among smokers. Our Nepalese findings support an association (more hypertensives among users), yet they must be interpreted cautiously. For example, reverse causation could play a role if hypertensive individuals quit smoking, or smokers may have other healthier habits (or a lower weight) that offset acute nicotine effects. Notably, our analysis did not distinguish between smoked and smokeless tobacco; given Nepal's high use of gutkha, betel quid, khaini and other smokeless products, future work should examine whether different forms of tobacco have different effects on blood pressure.

Beyond tobacco, multiple other factors influence hypertension risk. Global evidence shows that high dietary salt and low potassium intake, obesity, heavy alcohol use, and physical inactivity are major contributors to elevated blood pressure (Charchar et al., 2024; Zhou et al., 2021). For example, nationally and internationally, alcohol consumption and sedentary lifestyle each significantly raise hypertension risk (Gao et al., 2023; Ojangba et al., 2023). Environmental pollution is also emerging as a risk factor: long-term exposure to fine particulate matter, solid fuel combustion products and other air pollutants has been linked to small but significant increases in systolic and diastolic blood pressure, and higher odds of hypertension (Aryal et al., 2022; Basith et al., 2022; Bhatnagar, 2022; Chen et al., 2024). In Nepal, rapid urbanisation and lifestyle changes may be increasing these risks alongside tobacco use. Our study was limited to tobacco and basic sociodemographics; future research should use multivariable models to adjust for body mass index, diet, physical activity, alcohol use, air quality and other socio-economic determinants. Such a comprehensive analysis would clarify the independent effect of tobacco on hypertension and better guide prevention strategies in South Asia.

CONCLUSION

In this nationally representative study of adult men and women in Nepal, we found that users of any tobacco product were significantly more likely to have hypertension than non-users. This suggests that tobacco consumption contributes to increased cardiovascular risk via higher blood pressure. These results reinforce the urgency of tobacco control in Nepal: discouraging smoking and smokeless tobacco use could be an effective strategy to prevent or mitigate hypertension and its sequelae.

Given the multifactorial nature of hypertension, however, tobacco control should be part of a broader approach. Future work should investigate other modifiable factors – notably diet (salt and fat), alcohol use, obesity, physical inactivity, and environmental pollution – in relation to hypertension. Multivariate studies that include these risk factors are needed to fully understand and combat the burden of hypertension in Nepal and similar countries. By addressing tobacco along with these lifestyle and environmental determinants, public health programs can more effectively reduce cardiovascular disease risk.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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