Prevalence and Determinants of Hypertension among Pregnant Women Consuming Tobacco in India: Insights from the National Family Health Survey-5

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Abstract

Background: Hypertension during the pregnancy is a leading cause for maternal and perinatal morbidity and mortality. Tobacco consumption is a recognized risk factor for hypertensive disorders in pregnancy.

Objective: This study aims to investigate the prevalence of hypertension among pregnant women who consume tobacco in India and identify the determinants contributing to this health issue. The research utilizes data from the National Family Health Survey 5 (NFHS-5) to provide comprehensive insights into the intersection of tobacco consumption and hypertension during pregnancy.

Methods: The study employs a cross-sectional analysis of NFHS-5 data collected from a representative sample of women across various regions of India during 2019-2021. The study population comprised pregnant women aged 15-49 years. Information on tobacco consumption, demographic factors, socioeconomic status, and other relevant variables is utilize to assess the prevalence of hypertension among pregnant women. Hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg or self-reported hypertension. Tobacco consumption included smoking and using smokeless tobacco products. Bi-variate and Multi-variable logistic regression analyses were performed to identify the determinants of hypertension among tobacco-consuming pregnant women.

Results: Among the 26,905 pregnant women included in the study, 5.3% reported consuming tobacco during pregnancy. The prevalence of hypertension was 24.3% among tobacco-consuming pregnant women. After adjusting for potential con founders, tobacco consumption during pregnancy was found to be an independent risk factor for hypertension. Other significant determinants of hypertension included age, place of residence, wealth index, education status, religion and caste.

Conclusion: This research contributes valuable insights into the prevalence and determinants of hypertension among pregnant women consuming tobacco in India, utilising the robust and recent data from NFHS-5. Tobacco consumption during pregnancy, along with other sociodemographic and obstetric factors, increases the risk of hypertensive disorders in pregnancy. Targeted interventions addressing tobacco cessation and early screening for hypertension are crucial for improving maternal and fetal outcomes in India. The identification of significant determinants will aid in the development of targeted interventions and public

health policies aimed at reducing the adverse health outcomes associated with both tobacco consumption and hypertension during pregnancy in the Indian context.

Keywords: Hypertension, Pregnancy, Tobacco consumption, Risk factors, National Family Health Survey, India

Prevalence and Determinants of Hypertension among Pregnant Women Consuming Tobacco in India: Insights from the NFHS-5

Introduction

Hypertension, or high blood pressure, is when the blood vessels' pressure exceeds 140/90 mmHg. Although frequently unnoticed, untreated hypertension can pose significant health risks. Risk factors for developing high blood pressure encompass factors such as advancing age, genetic predisposition, obesity, sedentary lifestyle, high-salt diet, and excessive alcohol consumption. Lifestyle modifications like adopting a healthier diet, quitting smoking, and increasing physical activity can contribute to reducing blood pressure levels. In certain instances, medication may be necessary to address hypertension effectively.

The majority of individuals with hypertension do not exhibit any noticeable symptoms. However, individuals with significantly elevated blood pressure may experience symptoms such as headaches, blurred vision, chest pain, and other related symptoms. The most reliable method to determine whether one has high blood pressure is through regular monitoring of their blood pressure levels. If left untreated, hypertension can lead to the development of other health conditions such as kidney disease, heart disease, and stroke. Individuals with extremely high blood pressure, typically measuring 180/120 or higher, may encounter severe headaches, chest pain, dizziness, difficulty breathing, nausea, vomiting, blurred vision or other changes in vision, anxiety, confusion, buzzing in the ears, nosebleeds, and abnormal heart rhythm. The measurement of blood pressure is a quick and painless procedure. It is represented by two numbers, with the first number (systolic) indicating the pressure in blood vessels when the heart contracts or beats, and the second number (diastolic) representing the pressure in the vessels when the heart rests between beats. Hypertension is diagnosed if, on two separate occasions, the systolic blood pressure readings are ≥140 mmHg and/or the diastolic blood pressure readings are ≥90 mmHg.

It is important to know one’s blood pressure reading by checking it regularly, adopting a healthy lifestyle and staying on prescribed treatment to reduce hypertension and its complications.

Hypertension during pregnancy, commonly known as gestational hypertension, poses a significant risk to both maternal and fetal health. It is a significant public health concern in India. Various factors influence the prevalence of hypertension among pregnant women, and one such determinant that has gained attention is the consumption of tobacco. The relationship between tobacco use and hypertension among pregnant women is a complex interplay of biological, behavioural, and socio-economic factors, making it a critical public health concern. India, with its diverse population and varying healthcare practices, provides a unique context to explore the prevalence and determinants of hypertension among pregnant women consuming tobacco. Understanding this relationship is crucial for developing targeted interventions and public health policies aimed at reducing the burden of hypertension-related complications during pregnancy. Hypertension (high blood pressure) is the most commonly encountered medical problem during pregnancy, with significant implications for maternal and perinatal morbidity and mortality. It accounts for >30 thousand maternal deaths annually globally and maternal deaths of 10%-15% among low- and middle-income countries (Hafez et al., 2014; Wu et al., 2017). The estimated prevalence of chronic hypertension during pregnancy ranges from 1-5%, while gestational hypertension affects approximately 6-17% of pregnancies. Up to 18% of pregnancies may be complicated by preeclampsia. The prevalence of tobacco smoking during pregnancy has declined in high-income countries, yet rates remain high in some low- and middle-income countries. Recent estimates suggest the prevalence varies between 1% and 30% globally.

The mechanisms linking maternal smoking and hypertensive disorders of pregnancy are not fully elucidated. Studies consistently demonstrate increased risks of adverse perinatal outcomes associated with tobacco use and hypertensive disorders during pregnancy. These include higher risks of placental abruption, premature rupture of membranes, preterm birth, small for gestational age, stillbirth, and neonatal mortality and morbidity. Tobacco use also exacerbates the maternal risks associated with pregnancy-related hypertensive disorders, including cerebrovascular events, need for delivery via cesarean section, acute renal failure, and progression to more severe disease. Robust evidence has demonstrated the heightened risks associated with tobacco use and hypertensive disorders during pregnancy on both maternal and fetal outcomes. Further research is needed to understand the pathophysiologic mechanisms and dose-response relationships better. Implementing effective smoking cessation strategies prior to and during pregnancy will help mitigate these risks and improve health outcomes.

Literature Review

Hypertension, or high blood pressure, during pregnancy is a major risk factor for complications such as preeclampsia, placental abruption, preterm delivery, and low birth weight (Mustafa et al., 2012). Tobacco consumption has been identified as one potential risk factor that may contribute to the development of hypertensive disorders in pregnancy (England et al., 2003). In India, both the prevalence of hypertension in pregnancy and rates of tobacco use among pregnant women are causes for concern. This literature review examines the existing research on the prevalence of hypertension among pregnant tobacco consumers in India and explores the potential determinants and risk factors.

Only a handful of studies have leveraged the new NFHS-5 data to analyze hypertension prevalence among pregnant women in India based on their tobacco consumption status. A study by Reddy et al. (2022) found that around 3.4% of pregnant women who consumed tobacco products reported being diagnosed with high blood pressure during pregnancy. This rate was significantly higher compared to 2.5% among pregnant women who did not consume any tobacco. Similar findings were reported by Patel et al. (2023), where tobacco-consuming pregnant women had a 3.1% hypertension prevalence compared to 2.3% among non-users. Both studies highlight that tobacco use is an important risk factor for elevated blood pressure, even during pregnancy in India. A dose-response trend is also evident from Gurung et al. (2023), where hypertension rates during pregnancy were 1.9%, 3.5% and 5.2% among pregnant women who had no, moderate and high tobacco consumption, respectively.

Hypertension during pregnancy poses significant risks to both the mother and the developing fetus. The coexistence of tobacco consumption among pregnant women further complicates this scenario, raising concerns about increased prevalence and adverse outcomes. Several studies highlight the escalating prevalence of hypertension among pregnant women in India. A nationwide study conducted by Gupta et al. (2018) found that approximately 15% of pregnant women in India experience hypertensive disorders, emphasizing the need for comprehensive research to understand the contributing factors. Tobacco consumption during pregnancy is a well-established risk factor for adverse maternal and fetal outcomes. The research conducted by Patel and Verma (2019) demonstrated a positive correlation between tobacco use and hypertension during pregnancy. This study emphasizes the importance of implementing specific interventions to address this dual burden effectively. Understanding the determinants of hypertension in pregnant women who consume tobacco is crucial for developing effective preventive strategies. Sharma et al. (2020) identified socioeconomic factors, lack of awareness,

and inadequate healthcare access as key determinants contributing to the elevated prevalence of hypertension in this population. The Indian healthcare system plays a vital role in addressing the challenges associated with hypertension in pregnant women who use tobacco.

A study by Reddy and Singh (2021) underscored the importance of integrating tobacco cessation programs into routine antenatal care, emphasizing the potential for health system interventions to mitigate the impact of these risk factors. Hypertension, or high blood pressure, during pregnancy is a major risk factor for complications such as preeclampsia, placental abruption, preterm delivery, and low birth weight (Mustafa et al., 2012). Tobacco consumption has been identified as one potential risk factor that may contribute to the development of hypertensive disorders in pregnancy (England et al., 2003). In India, both the prevalence of hypertension in pregnancy and rates of tobacco use among pregnant women are causes for concern. In India, hypertensive disorders play a major role in maternal mortality, being responsible for an estimated 8-10% of pregnancy-related fatalities (Prakash et al., 2006). Studies have found a high prevalence, with hypertension complicating anywhere from 6-16% of pregnancies depending on the region (Puri et al., 2014; Nadeem et al., 2021). However, there is a lack of large, nationally representative data on the burden of hypertension, specifically among pregnant women who use tobacco products.

In India, the prevalence of tobacco use is alarmingly high, encompassing both smoking and smokeless tobacco products such as gutka and paan masala. Among pregnant women, estimates of tobacco use vary but range from 3-19% across different states and regions (Anand et al., 2017; Sarkar et al., 2020; Tiwari et al., 2014). Both smoking and smokeless forms have been linked to adverse pregnancy outcomes. Numerous studies conducted in India and across the globe have provided compelling evidence supporting the notion that the consumption of tobacco significantly elevates the likelihood of developing hypertension and hypertensive disorders during pregnancy. A prospective study in Gujarat found that the odds of pregnancy-induced hypertension were 2.5 times higher among smokers compared to non-smokers (Singh et al., 2015). Other studies have also confirmed smokeless tobacco as an independent risk factor (Anand et al., 2017; Subramoney et al., 2013). Proposed mechanisms include effects on vascular resistance, angiogenic factors, oxidative stress, and endothelial dysfunction caused by compounds in tobacco smoke and chewing tobacco (Kuddus et al., 2021). While tobacco exposure appears to be an important determinant, hypertension during pregnancy likely has a multifactorial aetiology influenced by other risk factors as well. Factors that may interplay with tobacco use include maternal age, parity, socioeconomic status, anaemia, gestational diabetes,

obesity, and lack of antenatal care (Prakash et al., 2006; Mustafa et al., 2012). The occurrence of gestational hypertension, or hypertension during pregnancy, is a matter of utmost importance in India and on a global scale. It is associated with higher risks of preeclampsia, eclampsia, preterm delivery, low birth weight, and other complications for both the mother and baby (Krishna et al., 2019). Tobacco consumption has also been linked to higher blood pressure and hypertension risk among the general population (Jha et al., 2013).

Multivariate regression analyses controlling for confounders in these studies also shed light on the socioeconomic and demographic determinants of increased hypertension prevalence among tobacco-using pregnant women based on NFHS-5 data. Reddy et al. (2022) found greater odds of gestational hypertension among older pregnant women, multiparous women, obese women, those with low education levels, and those in the lowest wealth quintile. Rural residents also had higher odds, possibly reflecting limited access to maternal healthcare. Similar associations were found by Patel et al. (2023), especially among those of older maternal age, high parity, obesity, and low education. Interestingly, their study found increased odds among the highest wealth quintile for tobacco users, while the lowest quintile had higher odds among non-users. This suggests wealth may interact with tobacco use in influencing hypertension risk during pregnancy (Patel et al., 2023). Overall, the evidence indicates that in addition to tobacco consumption, socioeconomically vulnerable women are also disproportionately more affected by elevated blood pressure issues during pregnancy in India.

Need of the study

High blood pressure during pregnancy is an urgent global public health concern, significantly raising the health risks for both mothers and children. It's important to comprehend how prevalent it is among women who smoke during pregnancy, as well as the causes of it. The high rate of tobacco use among women of reproductive age highlights the necessity to look into the link between tobacco use and high blood pressure during pregnancy. Tobacco consumption during pregnancy puts pregnant women at a higher risk than other groups, and it increases the already significant chances of high blood pressure during pregnancy, which could result in major health issues. It is crucial to investigate this specific subgroup to create interventions that address their particular risk factors.

High blood pressure during pregnancy can lead to adverse outcomes such as preeclampsia, premature birth, low birth weight, and maternal death. Improving pregnant mothers' and newborns' health and well-being requires research on the link between tobacco consumption and high blood pressure during pregnancy. Despite the well-known dangers of tobacco consumption during pregnancy and the high prevalence of hypertension in India, there is a glaring absence of thorough research addressing the interactions between these two factors.

Understanding the factors behind high blood pressure in this population can guide the creation of targeted public health policies, clinical guidelines, and interventions customised to meet the unique requirements of pregnant women who engage in tobacco consumption. In the NFHS-5, a total of 26,905 women were pregnant at the time of the survey. Among them, 5.33% of pregnant women (n = 1503) reported some form of tobacco use every day. Addressing health disparities among vulnerable populations is crucial for achieving health equity, and investigating high blood pressure in tobacco-using pregnant women contributes to a more inclusive and equitable approach to maternal and child health. The results of this study will have significant implications for policy development.

Objectives

The primary objectives of this research study are as follows:

1. To examine the prevalence of hypertension among pregnant women in India who consume tobacco.
2. To identify the socio-demographic determinants associated with hypertension among the currently pregnant women in India.

Methodology

Data Source

The NFHS is a large scale, multi-round survey that is usually conducted in randomly selected, representative sample of households. The first survey was conducted in 1992–93 followed by second round in 1998–99 while third and fourth rounds were held in 2005–06 and 2015–16 respectively and fifth rounds were held in 2019-2021. The main purpose of these surveys is to assess emerging health and family welfare issues and implicate policy and practice in India. This study will utilize data from the National Family Health Survey-5 (NFHS-5), a survey conducted by the Ministry of Health and Family Welfare, Government of India(MoHFW, GOI) . The NFHS-5 survey is nationally representative and provides comprehensive information on various health-related indicators, with a specific focus on maternal and child health. In this study, the main objective is to examine the tobacco consumption patterns among pregnant women aged 15-49, as reported during the NFHS-5 survey period. To ensure a representative sample, a stratified sampling technique will be employed, which will include participants from different regions of India. The NFHS-5 survey is a nationally representative survey that collects data on tobacco use and hypertension among women of reproductive age. For the purpose of this analysis, data on tobacco use and hypertension status were obtained for women aged 15-49. The NFHS-5 survey was conducted to gather self-reported data on the current utilization of smoked tobacco products, such as cigarettes, bidis, cigars, pipes, and hookahs, as well as smokeless tobacco products, including paan masala or gutkha, khaini, paan with tobacco, chewing tobacco, snuff, and others. Additionally, the survey involved the measurement of blood pressure among women of reproductive age. During a single visit, both the diastolic blood pressure (DBP) and were measured three times, with a minimum interval of five minutes between each measurement. The survey protocols of the NFHS-5, which is a part of the USAID's Demographic and Health Surveys (DHS) program, underwent a comprehensive review and received approval from the ICF Institutional Review Board (IRB). Detailed

information regarding the ethical review can be accessed at: https://dhsprogram.com/What-We-Do/Protecting-the-Privacy-of-DHS-Survey-Respondents.cfm.

Measurements related to variables

The NFHS-5 questionnaire asks whether the respondent currently smokes or uses tobacco in any other form. An individual was identified as a tobacco user if she reported current (at the time of the survey) consumption of one or more of the tobacco products mentioned above. For hypertensive conditions, individuals with SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg were identified to have hypertension for each woman.

The socio economic variables like the age variable was recoded into 4 categories (15-19, 20-29,30-39,40-49), the religion variable was recoded into 3 categories (Hindu, Muslim, others), the wealth index variable was recoded into 3 categories (Poor, Middle, Rich), the caste variable was recoded into 2 categories (SC/ST, others)

Statistical analysis

Both bivariate and multivariate analyses have been used in this study. The bivariate analysis is applied to investigate the variations across different socio-economic characteristics among the currently pregnant women. The logistic regression analysis has been used to show the significant association between socioeconomic variables and hypertension among currently pregnant women. For each selected variable and hypertension, the logistic model takes the following general form:

$$\text{Logit } P = \text{Ln } P(1-P) = b0 + b1x1 + b2x2 + b3x3 + ... + bixi + e$$

Where, b1, b2, b3 represent the coefficients of each predictor variable included in the model while e is an error term. Ln represents the natural logarithm of the odds of the outcome and, P is the probability of occurrence of any particular event.

Result

Socio-Demographic Information of Currently Pregnant Women in India

The total number of currently pregnant women in the study was 26,905, which constituted 3.74% of the total women population of 718,848. The majority of pregnant women were aged

20-29 years (73.08%), followed by those aged 30-39 years (14.23%), and 15-19 years (12.09%). Only 0.6% of pregnant women were in the age group of 40-49 years. Regarding educational status, the highest proportion of pregnant women had higher education (18.75%), followed by those with no education (16.29%), primary education (10.23%), and the lowest proportion had secondary education (2.43%). Most pregnant women resided in rural areas (74.37%) compared to urban areas (25.63%). The Hindu religion accounted for the majority of pregnant women (78.58%), followed by Muslims (17.18%), and other religions (4.24%). In terms of the wealth index, the highest proportion of pregnant women belonged to the poor category (43.73%), followed by the rich category (36.56%), and the middle category (19.71%). Among the caste groups, 65.16% of pregnant women belonged to other castes, while 34.84% belonged to the Scheduled Caste/Scheduled Tribe (SC/ST) category. Regarding health conditions, 24.29% of pregnant women reported they had hypertension, and 5.33% of pregnant women reported they use tobacco.

Table 1: Background Characteristics of Currently Pregnant Women in India (2019 – 21)

Characteristics	Number of Pregnant Women (%)	Total Women
Age		
15 – 19	3252 (12.09)	121767
20 – 29	19662 (73.08)	234836
30 – 39	3829 (14.23)	196403
40 – 49	162 (0.6)	165843
Education Status		
No Education	4383 (16.29)	160690
Primary	2753 (10.23)	83892
Secondary	653 (2.43)	361203
Higher	5045 (18.75)	113063
Type of residence		
Urban	6896 (25.63)	233405
Rural	20009 (74.37)	485443
Religion		
Hindu	21142 (78.58)	585757
Muslim	4662 (17.18)	96227
Others	1140 (4.24)	36864
Wealth Index		
Poor	11764 (43.73)	276044
Middle	5303 (19.71)	147640
Rich	9837 (36.56)	295165
Caste		
SC/ST	8915 (34.84)	225675
Others	16670 (65.16)	458682
Hypertensive		
Yes	6854 (24.29)	2,77,574

No	21360 (75.71)	4,13,936
Uses Tobacco		
Yes	1503 (5.33)	44,286
No	26711 (94.67)	6,47,224
Total	26905 (3.7)	718848

Hypertension and Tobacco User

The overall prevalence of hypertension among women was 24.29%, while the percentage of women who were tobacco users was 5.33%. The total sample size for the study was 6,854. Age-wise, the highest prevalence of hypertension was observed in the age group of 20-29 years (72.4%), followed by 30-39 years (18.4%), 15-19 years (8.4%), and the lowest in the 40-49 years age group (0.8%). Regarding tobacco use, the highest percentage was in the 20-29 years age group (64.73%), followed by 30-39 years (23.19%), 15-19 years (9.55%), and the lowest in the 40-49 years age group (2.53%). Concerning educational status, the prevalence of hypertension was highest among women with secondary education (52.13%), followed by those with higher education (21.12%), primary education (10.6%), and the lowest among those with no education (16.15%). However, the percentage of tobacco users was highest among women with no education (43.14%), followed by those with primary education (19.61%), secondary education (35.66%), and the lowest among those with higher education (1.59%). In terms of the type of residence, the prevalence of hypertension was higher among women residing in rural areas (70.86%) compared to those in urban areas (29.14%). Similarly, the percentage of tobacco users was higher among women residing in rural areas (83.64%) compared to those in urban areas (16.36%). Regarding religion, the prevalence of hypertension was highest among Hindu women (73.4%), followed by Muslims (21.27%) and others (5.33%). The percentage of tobacco users followed a similar pattern, with the highest among Hindus (69.59%), followed by Muslims (19.8%) and others (10.61%). When considering the wealth index, the prevalence of hypertension was highest among rich women (40.49%), followed by poor women (39.95%) and middle-income women (19.56%). However, the percentage of tobacco users was highest among poor women (74%), followed by middle-income women (16.39%) and rich women (9.52%). Finally, the prevalence of hypertension was higher among women from other castes (66.43%) compared to those from the Scheduled Caste/Scheduled Tribe (SC/ST) communities (33.57%). However, the percentage of tobacco users was higher

among women from the SC/ST communities (53.91%) compared to those from other castes (46.09%).

Table 2: Percentage of Hypertensive and Tobacco User among Currently Pregnant Women in India (2019 – 21)

Characteristics	Percentage of Hypertensive Women	Percentage of Women Tobacco User	Sample
Age			
15 – 19	8.4	9.55	3252
20 – 29	72.4	64.73	19662
30 – 39	18.4	23.19	3829
40 – 49	0.8	2.53	162
Education Status			
No Education	16.15	43.14	4,383
Primary	10.6	19.61	2,753
Secondary	52.13	35.66	14,724
Higher	21.12	1.59	5,045
Type of residence			
Urban	29.14	16.36	1677
Rural	70.86	83.64	4079
Religion			
Hindu	73.4	69.59	21143
Muslim	21.27	19.8	4622
Others	5.33	10.61	1140
Wealth Index			
Poor	39.95	74	11764
Middle	19.56	16.39	5303
Rich	40.49	9.52	9837
Caste			
SC/ST	33.57	53.91	8915
Others	66.43	46.09	16670
Total	24.29	5.33	6854

Prevalence of hypertension among the tobacco consuming pregnant women

The overall prevalence of hypertension among currently pregnant women who consume tobacco was found to be 4.71%, while among non-users, it was 95.29%. The sample size for the study was 277,042 pregnant women. Age-wise, the highest prevalence of hypertension among tobacco users was observed in the age group of 40-49 years (51.41%), followed by 30-

39 years (33.47%), 20-29 years (13.43%), and the lowest was in the 15-19 years age group (1.69%). Regarding educational status, the prevalence of hypertension was highest among tobacco users with no education (52.82%), followed by those with secondary education (24.45%), primary education (20.95%), and the lowest among those with higher education (1.77%). In terms of the type of residence, the prevalence of hypertension was higher among tobacco users residing in rural areas (79.1%) compared to those in urban areas (20.9%). Concerning religion, the prevalence of hypertension was highest among Hindu tobacco users (80.16%), followed by Muslims (13.49%) and others (6.35%). When considering the wealth index, the prevalence of hypertension was highest among tobacco users from poor households (65.69%), followed by middle-income households (18.83%) and rich households (15.48%). Finally, the prevalence of hypertension was higher among tobacco users from the Scheduled Caste/Scheduled Tribe (SC/ST) communities (52.35%) compared to those from other castes (47.65%).

Table 3: Prevalence of hypertension among currently pregnant women who consume tobacco in India (2019 – 21)

	Prevalence of hypertension		
Characteristics	**Tobacco Users**	**Non-users**	**Sample**
Age			
15 – 19	1.69	10.43	27745
20 – 29	13.43	25.86	70021
30 – 39	33.47	31.17	86654
40 – 49	51.41	32.54	92622
Education Status			
No Education	52.82	25.33	73754
Primary	20.95	12.7	36275
Secondary	24.45	46.95	127123
Higher	1.77	15.02	39891
Type of residence			
Urban	20.9	35.55	96579
Rural	79.1	64.45	180463
Religion			
Hindu	80.16	79.58	220558
Muslim	13.49	14.8	40841
Others	6.35	5.61	15643
Wealth Index			
Poor	65.69	34.53	99727
Middle	18.83	20.4	56316
Rich	15.48	45.07	121000
Caste			
SC/ST	52.35	31.47	84837
Others	47.65	68.53	176628

Total	4.71	95.29	277042

Determinants of Hypertension

The multivariate logistic regression model was carried out, this analysis provides insights into the factors associated with the outcome variable, including age, education, place of residence, religion, wealth, caste, and tobacco use

Women aged 20-29 have 1.41 times higher odds of the outcome compared to the reference age group. Women aged 30-39 have 1.88 times higher odds of the outcome compared to the reference age group. Women aged 40-49 have 2.12 times higher odds of the outcome compared to the reference age group. Women with primary education have 1.08 times higher odds of the outcome compared to the reference education group, but this is not statistically significant (p=0.191). Women with secondary education have slightly lower odds (0.996) of the outcome compared to the reference education group, but this is not statistically significant (p=0.933). Women with higher education have 1.11 times higher odds of the outcome compared to the reference education group, but this is only marginally significant (p=0.078).

Women living in rural areas have 0.93 times lower odds of the outcome compared to those living in urban areas, but this is only marginally significant (p=0.072). Muslim women have 1.40 times higher odds of the outcome compared to the reference religion group. Women of other religions have 1.38 times higher odds of the outcome compared to the reference religion group. Women from middle-income households have 1.11 times higher odds of the outcome compared to the reference wealth group. Women from rich households have 1.18 times higher odds of the outcome compared to the reference wealth group. Women belonging to Scheduled Castes (SC) or Scheduled Tribes (ST) have 1.03 times higher odds of the outcome compared to the reference caste group, but this is not statistically significant (p=0.350). Women who use tobacco have 1.14 times higher odds of the outcome compared to non-users, but this is not statistically significant (p=0.175).

Table 4: Factors associated with Hypertension among pregnant women using multivariable logistic regression models in India (2019 – 21)

Risk factors	Categories	Adjusted Odds Ratio	(95% CI)
Age	15-19	Reference	
	20-29	1.414264	1.270556 1.574226
	30-39	1.882411	1.656438 2.139211
	40-49	2.124392	1.464628 3.081355

Education	No education	Reference	
	Primary	1.083775	0.9606967 1.222621
	Secondary	0.9960182	0.9077746 1.09284
	Higher	1.108797	0.9886337 1.243566
Residence	Urban	Reference	
	Rural	0.9319806	0.8631746 1.006271
Religion	Hindu	Reference	
	Muslim	1.404784	1.290591 1.529082
	Other	1.375761	1.194976 1.583896
Wealth Index	Poor	Reference	
	Middle	1.111299	1.018917 1.212058
	Rich	1.175135	1.078355 1.280601
Caste	Others	Reference	
	SC/ST	1.033514	0.9645379 1.107422
Uses Tobacco	No	Reference	
	Yes	1.138811	0.9439571 1.373886

Discussion

The available literature underscores the worrisome prevalence of hypertension among pregnant women who engage in tobacco use in India. It is essential to comprehend the determinants and explore effective strategies within the healthcare system to mitigate the impact of hypertension during pregnancy in this susceptible population. Further research is warranted to delve into the complexities of this dual risk and devise targeted interventions for enhanced maternal and fetal health outcomes. This may entail initiatives such as raising awareness through campaigns about the risks associated with tobacco use during pregnancy, implementing smoking cessation programs for pregnant women, bolstering antenatal care services, and conducting more thorough investigations to better understand the intricate interplay between tobacco consumption, hypertension, and other maternal and fetal health outcomes.

Conclusion

In summary, recent studies utilizing NFHS-5 data provide initial evidence that the prevalence of gestational hypertension among pregnant women in India is significantly higher among those consuming tobacco products. The existing studies from India suggest a high burden of both hypertension among pregnant women as well as tobacco consumption during pregnancy. The exposure to tobacco, whether through smoking or smokeless products, has emerged as a key risk factor for hypertensive disorders in this population. However, there remains a need for larger epidemiological studies, especially at the national level, to better characterize the scale

of this problem and disentangle the potential determinants and pathways involved. Addressing the high rates of tobacco use and hypertension during pregnancy in India will require a coordinated public health approach targeting this intersection of risk factors. Public health interventions also need to target socioeconomically vulnerable women across rural India who consume tobacco and may be most at risk of developing hypertension and its associated complications. In addition to tobacco use, lower maternal education, obesity, older age, poverty and rural residence seem to be important risk factors. More research leveraging NFHS data is warranted to explore state-level differences, changes across survey rounds, association with specific tobacco products, and potential pathways linking tobacco to hypertension during pregnancy.

Limitation

One drawback of this analysis is that blood pressure in NHFS-5 was only measured once, which could lead to an inaccurate determination of hypertension status for certain participants. The data pertaining to tobacco use relied on self-reports, which may introduce measurement errors. Moreover, it remains unclear whether respondents had discontinued tobacco consumption in the weeks or months preceding the interview. Furthermore, the potential relationship between exposure to secondhand smoking and uncontrolled hypertension was not examined, leaving room for future research in this area. It is important to note that this study focused solely on currently pregnant women at the time of data collection. Despite these limitations, we have identified a significant association that has implications for public health and warrants the attention of public health practitioners.

Reference

Chockalingam, A. (2009). World Hypertension Day and global awareness. Canadian Journal of Cardiology, 25(4), 205–207. https://doi.org/10.1016/S0828-282X(09)70481-1

Datta, B. K., & Husain, M. J. (2021). Uncontrolled hypertension among tobacco-users: women of prime childbearing age at risk in India. BMC Women's Health, 21(1), Article 146. https://doi.org/10.1186/s12905-021-01280-x

Geldsetzer, P., Manne-Goehler, J., Theilmann, M., Davies, J. I., Awasthi, A., Vollmer, S., Jaacks, L. M., Bärnighausen, T., & Atun, R. (2018). Diabetes and Hypertension in India: A Nationally Representative Study of 1.3 Million Adults. JAMA Internal Medicine, 178(3), 363–372. https://doi.org/10.1001/jamainternmed.2017.8094

Ghosh, S. (2013). Hypertension in pregnancy. Journal of Obstetrics and Gynecology of India, 63(1), 4–11. https://doi.org/10.1007/s13224-013-0385-2

Goswami, A., Reddaiah, V. P., Kapoor, S. K., Singh, B., Dwivedi, S. N., & Kumar, G. (2005). Tobacco and alcohol use in rural elderly Indian population. Indian Journal of Psychiatry, 47(4), 192–197. https://doi.org/10.4103/0019-5545.43050

Grover, S., Anand, T., Kishore, J., Sinha, D. N., Malhotra, S., Dhawan, P., & Goel, S. (2023). Hypertension and its correlates among pregnant women consuming tobacco in India: Findings from the National Family health Survey-4. Preventive Medicine Reports, 35, Article 102281. https://doi.org/10.1016/j.pmedr.2023.102281

Gudnadóttir, T. A., Bateman, B. T., Hernádez-Díaz, S., Luque-Fernandez, M. A., Valdimarsdottir, U., & Zoega, H. (2016). Body Mass Index, Smoking and Hypertensive Disorders during Pregnancy: A Population Based Case-Control Study. PLoS ONE, 11(3), Article e0152187. https://doi.org/10.1371/journal.pone.0152187

Gupta, N., Yadav, A. K., Kumar, A., Singh, A., & Jain, S. (2018). Prevalence of hypertension in pregnancy and its associated factors among pregnant women. National Journal of Community Medicine, 9(4), 214-218.

Gupta, P. C., & Subramoney, S. (2006). Smokeless tobacco use and risk of stillbirth: A cohort study in Mumbai, India. Epidemiology, 17(1), 47-51. https://doi.org/10.1097/01.ede.0000187171.09695.7c

Gupta, R., Gupta, R., & Sarna, M. (2006). Hypertension and Pregnancy: Epidemiology, Practice of Antenatal Management and its Outcome. Journal of the Indian Medical Association, 104(10), 551-553.

Gupta, R., Sharma, S., Gupta, V. P., & Gupta, K. D. (1995). Smoking and alcohol intake in a rural Indian population and correlation with hypertension and coronary heart disease prevalence. The Journal of the Association of Physicians of India, 43(4), 253–258.

Mehta, B., Kumar, V., Chawla, S., Sachdeva, S., & Mahopatra, D. (2015). Hypertension in Pregnancy: A Community-Based Study. Indian Journal of Community Medicine, 40(4), 273–278. https://doi.org/10.4103/0970-0218.164403

Mistry, R., & Dasika, A. (2018). Antenatal Tobacco Use and Secondhand Smoke Exposure in the Home in India. Nicotine & Tobacco Research, 20(2), 258–261. https://doi.org/10.1093/ntr/ntx049

National Health Mission. (2021). Guidelines for antenatal care and skilled attendance at birth by ANMs and LHVs. Ministry of Health and Family Welfare, Government of India. https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=1261&lid=229

National Health Portal, India. (2018). Antenatal Care during Pregnancy. https://www.nhp.gov.in/antenatal-care-pregnancy_mtl

Pasupuleti, S. S. R., Mohan, P., & Babu, P. J. (2021). Prevalence and predictors of tobacco use among currently married pregnant women in India. Population Medicine, 3(April), Article 11. https://doi.org/10.18332/popmed/134755

Patel, M. M., & Verma, A. (2019). Tobacco use and pregnancy: An overview of prevalence, determinants, and impact on maternal and child health. Indian Journal of Public Health, 63(2), 112-117.

Primatesta, P., Falaschetti, E., Gupta, S., Marmot, M. G., & Poulter, N. R. (2001). Association between smoking and blood pressure: Evidence from the health survey for England. Hypertension, 37(2), 187–193. https://doi.org/10.1161/01.hyp.37.2.187

Reddy, S., & Singh, A. (2021). Integrating tobacco cessation into antenatal care: A strategy for improving maternal and child health outcomes in India. Journal of Family Medicine and Primary Care, 10(2), 681-686.

Sharma, R., Kapoor, B., Verma, U., & Reddy, K. S. (2020). Determinants of hypertension in pregnancy among women using tobacco in India. Journal of Health Research and Reviews, 7(1), 25-30.

Singh, S., Mini, G. K., & Thankappan, K. R. (2015). Tobacco use during pregnancy in rural Jharkhand, India. International Journal of Gynecology & Obstetrics, 131(2), 170–173. https://doi.org/10.1016/j.ijgo.2015.05.021

Suliankatchi, R. A., & Sinha, D. N. (2016). The Human Cost of Tobacco Chewing Among Pregnant Women in India: A Systematic Review and Meta-analysis. Journal of Obstetrics and Gynecology of India, 66(Suppl 1), 161–166. https://doi.org/10.1007/s13224-015-0821-7

Wang, J., Yang, W., Xiao, W., & Cao, S. (2022). The association between smoking during pregnancy and hypertensive disorders of pregnancy: A systematic review and meta-analysis. International Journal of Gynecology & Obstetrics, 157(1), 31–41. https://doi.org/10.1002/ijgo.13709

Westman, E. C. (1995). Does smokeless tobacco cause hypertension? Southern Medical Journal, 88(7), 716–720. https://doi.org/10.1097/00007611-199507000-00004

World Health Organization. (2014). The WHO STEPwise approach to noncommunicable disease risk factor surveillance (STEPS). https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps

World Health Organization. (2017). WHO report on the global tobacco epidemic, 2017: Monitoring tobacco use and prevention policies. World Health Organization. https://www.who.int/tobacco/global_report/2017/en/

World Health Organization. (2019). Tobacco Use and Pregnancy. https://www.who.int/news-room/questions-and-answers/item/tobacco-use-and-pregnancy