

Lifetime Prevalence and Predictors of Smoking Among Senior Secondary School Students in Public Schools in Makurdi, North-Central Nigeria

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ABSTRACT

Background: Tobacco use remains a leading cause of preventable morbidity and mortality worldwide, with most smokers initiating the habit during adolescence. However, recent evidence on smoking prevalence and its predictors among adolescents in North-Central Nigeria is limited. **Aim:** To determine the lifetime prevalence and predictors of smoking among senior secondary school students in public schools in Makurdi, Benue State, Nigeria. **Materials and Methods:** A school-based cross-sectional study was conducted among 390 senior secondary school students selected through a multistage sampling technique. Data were collected using a structured interviewer-administered questionnaire and analysed using SPSS version 25. Descriptive statistics were used to summarize the data, while Chi-square tests and multivariable logistic regression identified factors associated with lifetime smoking. Statistical significance was set at $p < 0.05$. **Results:** The lifetime prevalence of smoking was 43.4%, while 17.0% of respondents were current smokers. Approximately one-fifth (21.6%) initiated smoking at or before 13 years of age. Although most respondents demonstrated good knowledge of the harmful effects of smoking and generally negative attitudes towards tobacco use, smoking remained common. Having close friends who smoked was the strongest predictor of lifetime smoking (AOR=3.615; 95% CI: 2.273–5.749; $p < 0.001$), while rural residence independently increased the likelihood of smoking (AOR=1.930; 95% CI: 1.143–3.257; $p = 0.014$). **Conclusion:** Lifetime smoking among senior secondary school students in Makurdi is high despite good awareness of tobacco-related harms. Comprehensive school-based tobacco prevention programmes, peer-led interventions, and strengthened tobacco control measures, particularly in rural communities, are needed to prevent early smoking initiation among adolescents.

Keywords: Adolescents, Tobacco use, Smoking initiation, Peer influence, Nigeria

INTRODUCTION

Tobacco use remains one of the most significant preventable causes of disease, disability, and premature mortality worldwide, imposing an enormous health and economic burden on individuals, families, and health systems.¹ Smoking was the second largest contributor to the global burden of disease in 2019 and is strongly associated with chronic obstructive pulmonary disease, cardiovascular diseases, multiple cancers, and numerous other chronic conditions.^{2,3} According to the World Health Organization (WHO), approximately 1.3 billion people currently use tobacco worldwide, with nearly three-quarters residing in low- and middle-income countries where tobacco-related morbidity and mortality continue to rise.³ Tobacco use accounts for more than eight million deaths annually, including deaths attributable to second-hand smoke exposure, and disproportionately affects populations in resource-constrained settings.⁴

Despite decades of tobacco control efforts, WHO reports indicate that tobacco use has expanded substantially over the past four decades, particularly among young people and socioeconomically disadvantaged populations.⁵ Consequently, preventing smoking initiation during adolescence has become a global public health priority.

Adolescence represents a critical developmental period during which lifelong health behaviours are established. Initiation of tobacco use during these formative years substantially increases the likelihood of persistent nicotine dependence and continued smoking into adulthood.^{6,7} Smoking has also been described as a potential "gateway" behaviour that may precede experimentation with other psychoactive substances, including cannabis and other illicit drugs, consistent with the gateway drug hypothesis.^{6,7}

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Evidence suggests that approximately 80% of adult smokers initiate tobacco use before the age of 18 years, emphasizing the importance of interventions targeting adolescents before smoking behaviours become firmly established.^{6,9} The biological vulnerability of adolescents further amplifies the adverse consequences of tobacco exposure. Brain maturation continues until approximately 25 years of age, with substantial development occurring in the prefrontal cortex, the region responsible for executive functioning, decision-making, impulse control, and risk assessment.^{5,10} Nicotine exposure during this critical period disrupts normal neurodevelopment by altering dopaminergic reward pathways, thereby increasing susceptibility to nicotine dependence and other addictive behaviours.⁵ Adolescents who initiate smoking are reported to be nearly three times more likely to become daily smokers later in life than those who begin smoking as adults.⁵ Early smoking initiation, therefore, has important implications not only for long-term tobacco dependence but also for future physical, mental, and social health outcomes.

Smoking behaviour among adolescents is influenced by a complex interaction of individual, familial, social, environmental, and commercial determinants. Previous studies have identified parental or household tobacco use, peer smoking, exposure to tobacco advertising, easy access to tobacco products, educational attainment, psychosocial distress, personality characteristics, and other emotional or behavioural factors as important predictors of adolescent smoking.^{11–15} During adolescence, increased independence, sensation-seeking, risk-taking behaviour, and experimentation with psychoactive substances are common developmental characteristics that may increase susceptibility to smoking initiation.¹⁶ Among these factors, peer influence consistently emerges as one of the strongest determinants of adolescent smoking, with studies demonstrating that having close friends who smoke may increase an adolescent's likelihood of smoking by as much as ten-folds.¹⁷ These findings underscore the importance of understanding the social environments in which adolescents make decisions regarding tobacco use.

In Nigeria, tobacco use among adolescents continues to constitute an important public health concern. Findings from the Global Youth Tobacco Survey indicate that approximately one in five adolescents aged 13–15 years has experimented with cigarette smoking, while about one in ten currently uses cigarettes.¹⁸

Despite Nigeria's ratification of the WHO Framework Convention on Tobacco Control, tobacco products remain readily accessible to minors because cigarettes are frequently sold individually, contrary to Article 16 of the Convention, thereby facilitating experimentation and regular use among young people.¹⁹ Preventing tobacco use during adolescence is therefore essential because nearly all regular tobacco users begin smoking during adolescence or early adulthood, making this period the most appropriate window for effective preventive interventions.²⁰ Beyond its well-established long-term health consequences, adolescent smoking has also been associated with poor academic performance, increased engagement in risky sexual behaviours, greater susceptibility to sexually transmitted infections, and adverse mental health outcomes, including insomnia, hopelessness, depressive symptoms, and impaired psychosocial functioning.¹⁶

Accurate measurement of smoking behaviour is essential for identifying adolescents at risk and informing prevention strategies. Although current smoking (typically defined as smoking within the previous 30 days) is widely reported in tobacco surveillance, smoking behaviour among adolescents is often intermittent, experimental, and unstable.^{21,22} Consequently, reliance solely on current smoking may underestimate early experimentation and misclassify adolescents who are at the initial stages of tobacco use. Lifetime smoking prevalence ("ever smoked") provides a more sensitive indicator of smoking initiation and cumulative exposure, making it particularly appropriate for studies seeking to identify determinants of smoking initiation and early behavioural vulnerability.^{21,22}

Despite growing evidence on adolescent tobacco use in Nigeria, recent data from Benue State remain scarce, particularly regarding lifetime smoking prevalence and the sociodemographic factors associated with smoking among secondary school students. This evidence gap limits the development of context-specific tobacco control interventions tailored to adolescents in North-Central Nigeria. Therefore, this study aimed to determine the lifetime prevalence and sociodemographic predictors of smoking among senior secondary school students in public secondary schools in Makurdi, Benue State. The findings would provide contemporary baseline evidence to guide school-based tobacco prevention programmes, peer-focused behavioural interventions, counselling services, and policy initiatives aimed at reducing smoking

initiation among adolescents in the state and similar settings.

MATERIALS AND METHODS

Study Design, Population, and Area

This study employed a cross-sectional design among senior secondary school students attending public secondary schools in Makurdi, Benue State, North-Central Nigeria. Makurdi is the capital of Benue State and the administrative headquarters of Makurdi Local Government Area. The greater part of the city lies on the southern bank of the River Benue. Based on projected 2024 population estimates, Makurdi has approximately 490,000 inhabitants.²³ The metropolis has 16 public secondary schools with about 5,874 students enrolled in senior secondary classes (SS1–SS3). Public secondary schools are distributed across both urban and rural communities at an approximate ratio of 2:1 and include two single-sex schools (one male-only and one female-only). Each school has a “Principal” as the head of administration. Students whose parents or guardians provided consent and who assented to participate (for those aged below 18 years), as well as students aged 18 years or older who provided informed consent, were considered eligible and enrolled in the study.

Sample Size Estimation and Sampling Technique

The minimum sample size was estimated using the Cochran formula for a single population proportion for cross-sectional studies,²⁴ based on a lifetime smoking prevalence of 21.5% reported in a previous Nigerian study,²⁵ a 95% confidence level, a precision of 5%, a design effect of 1.5 to account for cluster sampling, and a 10% allowance for non-response. Since the study population was finite (5,874 senior secondary school students), finite population correction was applied,²⁴ yielding a final minimum sample size of 410 students. A multistage sampling technique was employed to select study participants. In the first stage, five of the eleven political wards in Makurdi Local Government Area (Ankpa/Wadata, Fiidi, North Bank I, Wailomayo, and Modern Market) were selected using simple random sampling by balloting. In the second stage, five public secondary schools were selected from each of the selected wards using simple random sampling. In the third stage, two of the three senior secondary classes (SS1, SS2, and SS3) were selected in each school by simple random sampling. Each selected class formed a cluster, and all

eligible students in those clusters were recruited into the study.

Data Collection

Data were collected over two-weeks using a structured interviewer-administered questionnaire adapted from previously validated instruments used in tobacco-related studies among adolescents.^{26–29} Senior researchers in the Department of Epidemiology and Community Health reviewed the questionnaire to ensure content validity and contextual appropriateness before use. The instrument obtained information on respondents' socio-demographic characteristics (including age, sex, religion, tribe, class, parental educational level, parental occupation, and place of residence), tobacco-related knowledge, attitudes towards smoking, smoking behaviours, and factors associated with cigarette smoking. The questionnaire was pretested among 40 senior secondary school students (approximately 10% of the calculated sample size) attending a private secondary school in Makurdi that was not included in the main study. Feedback obtained from the pretest was used to improve the clarity and sequencing of questionnaire items.

The principal investigators and five research assistants (who had two-day training sessions comprising role-plays and practical demonstrations of standardized interviews) collected data. Interviews were conducted in private settings within the schools to ensure confidentiality and minimize peer influence. Interviewers, who were young adults within a similar age range to the respondents, were trained to use neutral, non-judgmental language throughout the interviews to reduce interviewer bias, social desirability bias, and response bias. The interviewer-administered approach also ensured standardized data collection, clarification of tobacco-related terminology where necessary, and reduced missing data.

Data Analysis

Data were checked daily for completeness and consistency before entry into Microsoft Excel and subsequently exported to IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA) for analysis. Categorical variables were summarized using frequencies and percentages, while quantitative variables were summarized using means and standard deviations where appropriate. The primary outcome variable was lifetime cigarette smoking (ever smoked), defined according to the WHO Global Youth Tobacco Survey framework as having smoked a cigarette at least once during one's

lifetime.²⁶ The lifetime prevalence of cigarette smoking was calculated as the proportion of respondents who reported ever smoking. Associations between lifetime smoking status and independent variables, including socio-demographic characteristics, tobacco-related knowledge, attitudes, peer smoking, and parental smoking, were assessed using Pearson's Chi-square test (or Fisher's Exact test where appropriate). Variables found to be statistically significant at the bivariate level were entered into a binary logistic regression model to identify independent predictors of lifetime cigarette smoking. The outcome variable was coded as 1 for respondents who had ever smoked and 0 for those who had never smoked. The regression results were presented as adjusted odds ratios (aORs) with corresponding 95% confidence intervals (CIs) and p-values. All levels of statistical significance were set at $p < 0.05$.

Ethical Consideration

Ethical approval for the study was obtained from the Institutional Research Ethics Committee of the College of Health Sciences, Rev. Fr. Moses Orshio Adasu University, Makurdi. Permission to conduct the study was also obtained from the Benue State Ministry of Education and the principals of the selected public secondary schools before data collection commenced. The purpose of the study was explained to all eligible participants, and confidentiality and anonymity were assured. Written parental or guardian consent was obtained for participants younger than 18 years through formal engagement with parents or guardians, after which verbal assent was obtained from the students before participation. Students aged 18 years and above provided verbal informed consent before enrolment. Participation in the study was entirely voluntary, and respondents were informed of their right to decline participation or withdraw at any time without consequences.

RESULTS

Respondents' sociodemographic characteristics

A total of 410 questionnaires were administered, of which 390 were completed and included in the analysis, yielding a response rate of 95.0%. Most respondents were aged 16–20 years (283, 72.6%), while males accounted for over two-thirds of the study population (266, 68.2%). Christianity was the predominant religion (368, 94.4%), and the Tiv ethnic group constituted the majority of participants (307, 78.8%). Nearly half of the respondents (174, 44.6%) reported a monthly family income exceeding

₦100,000. With respect to place of residence, 145 respondents (37.2%) lived in rural areas, 144 (36.9%) resided in urban areas, and 101 (25.9%) lived in urban slum communities [Table 1].

Table 1: Respondents' socio-demographic characteristics

Variables	Frequency (%) n = 390
Age group (years)	
10-15	98 (25.1)
16-20	283 (72.6)
21-25	9 (2.3)
Sex	
Male	266 (68.2)
Female	124 (31.8)
Class	
SS1	25 (6.4)
SS2	150 (38.5)
SS3	215 (55.1)
Religion	
Christianity	368 (94.4)
Islam	14 (3.6)
Traditional worship	7 (1.8)
Others	1 (0.3)
Tribe	
Tiv	307 (78.8)
Idoma	38 (9.7)
Others	45 (11.5)
Monthly income (Naira)	
<10,000	50 (12.8)
10,000-50,000	72 (18.5)
51,000-100,000	94 (24.1)
>100,000	174 (44.6)
Parent's educational level	
No formal education	41 (10.5)
Primary education	25 (6.4)
Secondary education	135 (34.6)
Tertiary education	189 (48.5)
Living arrangement	
Parents	222 (56.9)
Guardian	110 (28.2)
Alone	35 (9.0)
Others	23 (5.9)
Primary source of information	
School	174 (44.6)
Internet	91 (23.3)
Healthcare providers	110 (28.2)
Family/friends	15 (3.9)
Father's occupation	
Farmer/fisher	175 (44.9)
Teacher	21 (5.4)
Trader/business	45 (11.5)
Civil servants	135 (34.6)
Others	14 (3.6)
Mother's occupation	
Farmer/fisher	173 (44.4)
Teacher	27 (6.9)
Trader/business	92 (23.6)
Others	98 (25.1)
Location of house address	
Rural	145 (37.2)
Urban slum	101 (25.9)
Urban	144 (36.9)

Respondents' knowledge and attitudes towards smoking

Knowledge of the harmful effects of smoking was generally high among respondents. Overall, 357 respondents (91.5%) recognized that smoking is harmful to health, while 313 (80.3%) were aware of the health risks associated with passive smoking. Lung cancer was the most frequently identified smoking-related health consequence (290, 74.4%). Schools were the most common source of health information on smoking (175, 44.9%), followed by healthcare providers (110, 28.2%) and the internet (91, 23.3%).

Table 2: Respondents' knowledge and attitude towards smoking

Variables	Frequency (%) n = 390
Ever heard about smoking or tobacco use	
Yes	352 (90.3)
No	38 (9.7)
If yes, the source of information	
School mates	105 (26.9)
Parents/guardians	74 (19.0)
Friends	72 (18.5)
Media (TV, radio, internet)	139 (35.6)
Agree that smoking is harmful to health	
Yes	357 (91.5)
No	33 (8.5)
If yes, health problems caused by smoking	
Lung cancer	290 (74.4)
Heart disease	91 (23.3)
Stroke	7 (1.8)
Cough	2 (0.5)
Agree that passive smoking can also harm health	
Yes	313 (80.3)
No	77 (19.7)
Primary source of health information	
School	175 (44.9)
Internet	91 (23.3)
Healthcare providers	110 (28.2)
Family/friends	14 (3.6)
Agree that someone of your age can smoke	
Yes	85 (21.8)
No	305 (78.2)
Agree that smoking makes someone look cool or more mature	
Yes	114 (29.3)
No	276 (70.7)
Would befriend someone who smokes	
Yes	118 (30.3)
No	272 (69.7)
Agree that smoking should be banned in public places	
Yes	234 (60.0)
No	156 (40.0)

Respondents also demonstrated predominantly negative attitudes toward tobacco use, with 305 (78.2%) indicating that it is inappropriate for individuals of their age to smoke, 272 (69.7%) reporting that they would not befriend someone who smokes, and 234 (60.0%) supporting a ban on smoking in public places [Table 2].

Respondents' smoking status and smoking history

The lifetime prevalence of smoking (ever smoked) was 43.4% ($n=169$), while the prevalence of current smoking was 17.0% ($n=66$). Early initiation of smoking was common, with 78 respondents (21.6%) reporting that they first experimented with smoking at or before 13 years of age. Cigarettes were the most commonly used tobacco product (75, 19.2%), followed by shisha (42, 10.8%), and marijuana (38, 9.7%). Among current smokers, smoking patterns varied, with respondents reporting daily, weekly, occasional, and rare smoking. Additionally, 39 respondents (10.0%) reported having attempted to quit smoking [Table 3].

Table 3: Respondents' smoking status and smoking history

Variables	Frequency (%) n = 390
Ever tried smoking a cigarette or any other substance	
Yes	169 (43.4)
No	221 (56.6)
If yes, age at first trial	
≤13 years	78 (21.6)
14 years	28 (7.8)
≥15 years	33 (9.3)
Not applicable	221 (61.3)
Currently smokes	
Yes	66 (17.0)
No	324 (83.0)
Substances smoked*	
Cigarettes	75 (19.2)
Marijuana	38 (9.7)
Shisha	42 (10.8)
Others	45 (11.6)
Smoking frequency	
Daily	16 (4.1)
Weekly	21 (5.4)
Occasionally	13 (3.3)
Rarely	16 (4.1)
Not applicable	324 (83.1)
Tried to stop smoking	
Yes	39 (10.0)
No	27 (6.9)
Not applicable	324 (83.1)

*Multiple responses allowed

Association between ever-smoked status and social factors among respondents

There was a statistically significant association between having close friends who smoked and respondents' lifetime smoking status, with a substantially higher proportion of ever-smokers among those whose close friends smoked compared with those whose friends did not smoke ($\chi^2=35.190$, $p<0.001$). The respondents' primary source of health information was also significantly associated with smoking status ($\chi^2=8.622$, $p=0.035$). Respondents whose primary source of information was healthcare providers (33.6%) or family and friends (33.3%) had lower proportions of lifetime smoking than those who primarily obtained information from schools (50.0%). Although nearly half 78 (49.1%) of respondents with a family member who smoked had themselves ever smoked, the association between family smoking and respondents' smoking status did not reach statistical significance ($\chi^2=3.198$, $p=0.074$). No significant associations were observed between smoking status and perceived peer pressure ($\chi^2=0.147$, $p=0.702$), exposure to tobacco advertisements ($\chi^2=0.025$, $p=0.874$), or learning about the dangers of smoking in school ($\chi^2=1.591$, $p=0.207$) [Table 4].

Association between respondents' sociodemographic characteristics and lifetime smoking status

Lifetime smoking status was significantly associated with respondents' residential location ($\chi^2=6.622$, $p=0.036$), class level ($\chi^2=9.955$, $p=0.007$), and tribe ($\chi^2=7.909$, $p=0.019$). The highest prevalence of lifetime smoking was observed among respondents residing in rural areas (51.7%), compared with those living in urban slums (38.6%) and urban areas (38.2%). Smoking prevalence also varied significantly across class levels and ethnic groups. However, no statistically significant associations were found between lifetime smoking status and age ($\chi^2=0.141$, $p=0.932$), sex ($\chi^2=2.183$, $p=0.140$), monthly family income ($\chi^2=6.122$, $p=0.410$), or living arrangement ($\chi^2=1.941$, $p=0.585$) [Table 5].

Predictors of lifetime smoking among respondents

Multivariable logistic regression analysis identified close friends who smoked and rural residence as independent predictors of lifetime smoking. Respondents with close friends who smoked had over three times the odds of having ever smoked compared with those whose close friends did not smoke (adjusted odds ratio [AOR]=3.615; 95% CI: 2.273–5.749; $p<0.001$). Similarly, respondents

residing in rural areas were nearly twice as likely to have ever smoked as those living in urban areas (AOR=1.930; 95% CI: 1.143–3.257; $p=0.014$). In contrast, age, sex, class level, and tribe were not independently associated with lifetime smoking after adjustment for other covariates [Table 6].

DISCUSSION

This study determined the lifetime prevalence and predictors of smoking among senior secondary school students in public schools in Makurdi, North-Central Nigeria. The findings revealed a high lifetime prevalence of smoking (43.4%) and a current smoking prevalence of 17.0%, with close friends who smoked and rural residence emerging as independent predictors of lifetime smoking. The lifetime prevalence observed in this study is considerably higher than the national estimates reported in previous reviews of tobacco use among Nigerian adolescents.^{27,30,31} Similarly, the current smoking prevalence exceeds the values reported in recent studies among adolescents in Ibadan, South-West Nigeria, and in an earlier study conducted in Benue State.^{27,32} The prevalence is also higher than that reported among adolescents in South-Eastern Nigeria,³³ although it is comparable to findings from North-Western Nigeria.³⁴ Differences in study design, sample characteristics, data-collection methods, and smoking indicators may partly explain these variations. Nevertheless, the higher prevalence observed in this study may also reflect increasing accessibility of tobacco products, inadequate enforcement of tobacco control measures, and continued exposure of adolescents to tobacco marketing despite existing legislation.³⁵

The high proportion of respondents who initiated smoking at or before 13 years of age is equally concerning, as early initiation has been consistently associated with a greater risk of persistent nicotine dependence and continued tobacco use into adulthood.³⁶ These findings underscore the need for strengthening school- and community-based tobacco prevention programmes that target children before smoking behaviours become established. Although respondents demonstrated good knowledge of the harmful effects of smoking and generally negative attitudes towards tobacco use, these favourable perceptions did not translate into low smoking prevalence. This finding suggests that knowledge alone may be insufficient to prevent smoking initiation among adolescents when strong social and environmental

Table 4: Association between ever-smoked status and social factors among respondents

Variables	Ever smoked, n (%)	Never smoked, n (%)	Test of significance
Close friends smoke			
Yes (n=132)	85 (64.4)	47 (35.6)	$\chi^2= 35.190$ p<0.001*
No (n=254)	82 (32.3)	172 (67.7)	
Family member smokes			
Yes (n=159)	78 (49.1)	81 (50.9)	$\chi^2= 3.198$ p=0.074
No (n=231)	91 (39.4)	140 (60.6)	
Peer pressure plays a role			
Yes (n=307)	131 (42.7)	176 (57.3)	$\chi^2= 0.147$ p=0.702
No (n=83)	38 (45.8)	45 (54.2)	
Advert on TV/social media			
Yes (n=259)	111 (42.9)	148 (57.1)	$\chi^2= 0.025$ p=0.874
No (n=131)	58 (44.3)	73 (55.7)	
Learnt dangers in school			
Yes (n=334)	139 (41.6)	195 (58.4)	$\chi^2= 1.591$ p=0.207
No (n=54)	30 (53.6)	26 (46.4)	
Primary source of information			
School (n=174)	87 (50.0)	87 (50.0)	$\chi^2= 8.622$ p=0.035*
Internet (n=91)	40 (44.0)	51 (56.0)	
Healthcare providers (n=110)	37 (33.6)	73 (66.4)	
Family/friends (n=14)	5 (33.3)	10 (66.7)	

χ^2 : Pearson's chi square test; *Statistically significant (p<0.05)

Table 5: Association between respondents' sociodemographic characteristics and lifetime smoking status

Variables	Ever smoked, n (%)	Never smoked, n (%)	Test of significance
Age group (years)			
10-15 (n=98)	44 (42.9)	54 (55.1)	$\chi^2= 0.141$ p=0.932
16-20 (n=283)	121 (42.8)	162 (57.2)	
21-25 (n=9)	4 (44.4)	5 (55.6)	
Sex			
Male (n=266)	122 (45.9)	144 (54.1)	$\chi^2= 2.183$ p=0.140
Female (n=124)	47 (37.9)	77 (62.1)	
Class			
SS1 (n=25)	12 (48.0)	13 (52.0)	$\chi^2= 9.955$ p=0.007*
SS2 (n=150)	50 (33.3)	100 (66.7)	
SS3 (n=215)	107 (49.8)	108 (50.2)	
Tribe			
Tiv (n=307)	144 (46.9)	163 (53.1)	$\chi^2= 7.909$ p=0.019*
Idoma (n=38)	10 (26.3)	28 (73.7)	
Others (n=45)	15 (33.3)	30 (66.7)	
Monthly income (Naira)			
<10,000 (n=50)	23 (46.0)	27 (54.0)	$\chi^2= 6.122$ p=0.410
10,000-50,000 (n=72)	33 (45.8)	39 (54.2)	
51,000-100,000 (n=94)	34 (36.2)	60 (63.8)	
>100,000 (n=174)	79 (45.4)	95 (54.6)	
Living arrangement			
Parents (n=222)	97 (43.7)	125 (56.3)	$\chi^2= 1.941$ p=0.585
Guardian (n=110)	43 (39.1)	67 (60.9)	
Alone (n=35)	18 (51.4)	17 (48.6)	
Others (n=23)	11 (47.8)	12 (52.2)	
House location			
Rural (n=145)	75 (51.7)	70 (48.3)	$\chi^2= 6.622$ p=0.036*
Urban slum (n=101)	39 (38.6)	62 (61.4)	
Urban (n=144)	55 (38.2)	89 (61.8)	

χ^2 : Pearson's chi square test; *Statistically significant (p<0.05)

Table 6: Predictors of lifetime smoking among respondents

Variables	Adjusted Odds Ratio (aOR)	95% CI		p-value
		Lower	Upper	
Age group (years)				
10-15	Reference			
16-20	0.730	0.432	1.232	0.239
21-25	0.723	0.164	3.188	0.668
Sex				
Female	Reference			
Male	1.180	0.723	1.927	0.507
Class				
SS1	Reference			
SS2	0.807	0.304	2.143	0.688
SS3	2.110	0.791	5.626	0.136
Tribe				
Others	Reference			
Tiv	1.753	0.843	3.647	0.133
Idoma	0.820	0.297	2.266	0.702
House location				
Urban	Reference			
Urban slum	0.830	0.466	1.478	0.526
Rural	1.930	1.143	3.257	0.014*
Close friends smoke				
No	Reference			
Yes	3.615	2.273	5.749	<0.001*

CI: Confidence interval; *Statistically significant ($p < 0.05$)

influences exist. Similar observations have been reported in previous studies, indicating that awareness of tobacco-related health risks does not necessarily prevent experimentation or sustained smoking behaviour among young people.^{28,35}

Comprehensive interventions should therefore combine health education with strategies that address the social determinants of smoking, including peer influence, accessibility of tobacco products, and enforcement of tobacco control policies. No significant difference in lifetime smoking was observed between male and female students, and sex was not an independent predictor of smoking. This finding contrasts with previous Nigerian studies and systematic reviews, which consistently reported a higher prevalence of smoking among males than females.^{31,37,40} The absence of a gender difference in the present study may indicate changing smoking patterns among adolescents, with increasing experimentation among females. The tobacco industry's marketing strategies, changing social norms, and inadequate implementation of tobacco control policies may be reducing the traditional gender disparities in smoking behaviour among Nigerian adolescents.³⁵

Consequently, tobacco prevention programmes should target both male and female students rather than focusing predominantly on boys.

Peer smoking emerged as the strongest independent predictor of lifetime smoking. Students who had close friends who smoked were more than three times as likely to have ever smoked compared with those whose close friends did not smoke. This finding is consistent with studies conducted in Nigeria, Botswana, and other settings, which identify peer influence as one of the most important determinants of smoking initiation during adolescence.^{1,5,38} Adolescence is characterized by increasing dependence on peer relationships, making young people particularly susceptible to social modelling and pressure to experiment with risky behaviours. Interventions that strengthen peer resistance skills, promote positive peer networks, and establish peer-led tobacco prevention programmes may therefore be particularly effective in reducing smoking initiation among secondary school students.

Residential location was also an independent predictor of lifetime smoking, with students residing in rural areas being almost twice as likely to have ever smoked as their

urban counterparts. This finding differs from some previous studies that reported a higher risk of smoking among urban adolescents due to greater exposure to tobacco advertising and retail outlets.¹⁹ However, it is consistent with evidence that geographical location influences adolescent smoking behaviour and may reflect contextual differences in access to tobacco products, parental supervision, recreational opportunities, and implementation of tobacco control measures.³⁹ The higher prevalence observed among rural students highlights the need to extend tobacco prevention programmes beyond urban centres and strengthen enforcement of restrictions on tobacco sales and marketing in rural communities.

Although class level and tribe were significantly associated with lifetime smoking in the bivariate analysis, they were not independent predictors after adjustment for potential confounders. Similarly, age and sex were not associated with smoking in the multivariable model. These findings suggest that social and environmental influences, particularly peer smoking and residential location, may exert a greater influence on smoking initiation than individual sociodemographic characteristics. This observation differs from some Nigerian studies that identified increasing age, male sex, and boarding school status as significant predictors of adolescent smoking.^{37,38,40} Variations in study populations, sampling methods, and contextual factors may explain these differences. Overall, this study demonstrates that smoking remains a substantial public health concern among secondary school students in Makurdi. The high lifetime prevalence, early age of initiation, and strong influence of peer smoking underscore the need for comprehensive tobacco control interventions that combine school-based health education, peer-led behavioural interventions, strengthened enforcement of tobacco control legislation, and targeted prevention programmes for rural communities. Such strategies are likely to reduce smoking initiation among adolescents and contribute to the long-term prevention of tobacco-related morbidity and mortality.

STUDY LIMITATIONS

This study has some limitations. First, it was conducted among students in selected public secondary schools in Makurdi, which may limit the generalizability of the findings to adolescents attending private schools or those in other parts of Benue State and Nigeria. Second, the

cross-sectional design precludes establishing temporal or causal relationships between the identified predictors and lifetime smoking. Finally, smoking behaviour was assessed using self-reported data and may therefore be subject to recall and social desirability biases, potentially leading to underreporting or overreporting of tobacco use. Despite these limitations, the study provides valuable baseline evidence on the burden and predictors of smoking among secondary school students in Makurdi and offers useful information for designing targeted tobacco prevention interventions.

CONCLUSION

This study found a high lifetime prevalence of smoking among senior secondary school students in public schools in Makurdi, despite good knowledge of the harmful effects of tobacco and generally negative attitudes towards smoking, highlighting a gap between awareness and behaviour. Close friends who smoke and rural residence were the principal predictors of lifetime smoking, underscoring the important influence of social and environmental factors on smoking initiation. Reducing tobacco use among adolescents will require comprehensive interventions that strengthen school-based tobacco prevention programmes, promote peer-led behavioural change initiatives, enforce restrictions on the sale and marketing of tobacco products to minors, and expand targeted prevention efforts in rural communities. These measures are essential for preventing early smoking initiation and reducing the future burden of tobacco-related diseases among young people.

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Conflict of interest

None declared.

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