

Prevalence of Vaping Among Nigerian Youths in Benin City

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Abstract:

➤ Background

The rising use of e-cigarettes among young people has emerged as a growing public health concern given its association with nicotine dependence and adverse respiratory and cardiovascular outcomes. This study assessed the prevalence of electronic cigarette (vaping) use among youths in Benin City, Edo State, Nigeria.

➤ Methodology

A convergent parallel mixed-methods design was adopted, combining a structured self-administered questionnaire with open-ended qualitative items. A total of 950 youths aged 15–35 years were sampled and stratified by age, gender, and educational level, exceeding the minimum sample size of 427 determined using Cochran's formula. Data were analyzed using descriptive statistics and chi-square tests.

➤ Results

Lifetime e-cigarette use was found among 37.2% of respondents (34.1%–40.3%), with 48.8% reporting use in the past 30 days; while awareness of e-cigarettes stood at 66.0%. Prevalence was significantly higher among males (42.4% vs. 33.1%) and among the 31–35-year age group (47.1%).

➤ Conclusion

The findings indicate that vaping has achieved substantial penetration among youths in Benin City and is closely linked to polysubstance use and the study recommends school- and community-based educational interventions, stricter enforcement of age-restriction policies, and further longitudinal research to track trends and inform youth-focused vaping prevention strategies in Nigeria

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I. INTRODUCTION

➤ Background to the Study

In the last decade, electronic nicotine delivery systems (ENDS, commonly called e-cigarettes or “vapes”) have moved from niche curiosity to a visible part of youth culture worldwide. E-cigarettes heat a flavored (often containing nicotine, propylene glycol, glycerin and flavorants) into an aerosol that is inhaled; these products are marketed with novel

flavors, sleek designs and social media imagery that appeal strongly (Moustafa et al., 2021). Although originally promoted in some regions as a harm-reduction alternative for adult smokers, their increased uptake among adolescents and young adults, many of whom have never smoked conventional cigarettes, has raised substantial public health concerns (Erinoso et al., 2021; Adegbile et al., 2024).

In Nigeria, the presence of ENDS is relatively recent but growing. National and Institutional surveys show lifetime (ever) use estimates among young people that vary by setting, but cluster in the single-digit to low-teens percentage and young adults reported an ever-use prevalence of about 7.9% (Erinoso et al., 2021). A 2024 scoping review of e-cigarette evidence in Nigeria summarized lifetime prevalences across studies ranging roughly from 5.8% to 20%, depending on sample and location, and highlighted wide heterogeneity in awareness, product access and measurement methods (Adegbile et al., 2024). These figures suggest that vaping is present and increasing among some groups of Nigerian youth and that surveillance remains limited.

Perceptions and social contexts shape whether young people try and continue to use vaping devices.

➤ *Statement of the Problem*

Vaping among young people poses several problems. First, it exposes developing brains to nicotine and other potentially harmful chemicals at a sensitive life stage, increasing the risk of nicotine dependence and possibly acting as a gateway to combustible tobacco use (Pediatrics and related literature summarized globally). Added to the above are the problems of inadequate local data and misperceptions.

➤ *Justification of the Study*

Collectively, the study will produce actionable knowledge for local stakeholders and contribute to the limited but growing Nigerian data.

➤ *Significance of the Study*

The study is important for the following stakeholders: Public health authorities (local/state), Educational institutions (secondary schools, universities), clinicians and mental-health providers, community and parent and researchers.

➤ *Objectives of the Study*

• *Broad objective*

To assess the prevalence of vaping (e-cigarette) use among youths in Benin City, Edo State, Nigeria.

• *Specific objectives*

- ✓ To estimate the prevalence of e-cigarette (vape) use among youths in Benin City.
- ✓ To explore associations between vaping and other substance use (e.g., alcohol, conventional tobacco) among the sampled youths.
- ✓ To provide evidence-based recommendations for local prevention, education and policy action.

➤ *Research Questions*

- What is the prevalence of e-cigarette use among youths in Benin City?

- Is vaping associated with other substance use (alcohol, conventional cigarette smoking, and cannabis) among youths in Benin City?

➤ *Hypotheses*

- H0₁: There is no association between age and use of e-cigarettes among youths in Benin City.
- H0₂: There is no association between sex (male vs female) and e-cigarette use among youths in Benin City.
- H0₃: Peer use of e-cigarettes is not associated with individual vaping behavior among youths in Benin City.
- H0₅: There is no association between alcohol use and vaping among youths in Benin City.

➤ *Scope of the Study*

- Population: Youths aged (specify range for your study design, e.g., 15–24 years or 15–35 years) residing in Benin City.
- Geographic: Benin City, Edo State, Nigeria. The study will not attempt to generalize beyond this urban area, though findings may inform similar urban Nigerian settings.
- Content: The study will focus on (a) self-reported prevalence (ever and current use)
- Limitations anticipated: Possible self-report bias (under- or over-reporting).

II. EMPIRICAL REVIEW

➤ *Research Question 1: Prevalence of Youth Vaping*

Lyzwinski et al. (2022) report that the uptake of e-cigarettes has markedly increased in recent years across the globe. A systematic review found that e-cigarette usage in teenagers increased by over 19% between 2011 and 2018 in the United States.

➤ *Research Question 2: Is Vaping Associated with Other Substance Use (Alcohol, Conventional Cigarette Smoking, and Cannabis)*

• *Prevalence of Dual Use*

Research in young adults found that 82.6% of e-cigarette consumers concurrently used additional nicotine products such as conventional cigarettes. Prevalence of nicotine dependence in this young population was 68% (Lyzwinski et al., 2022). Syahriza et al. (2022) report similar patterns, with approximately 1.3 million people in Great Britain using both conventional and electronic cigarettes according to Action on Smoking and Health (2014).

III. METHODOLOGY

➤ *Study Design*

This study employed a mixed-methods research design, specifically the convergent parallel design, which integrates both quantitative and qualitative approaches. This design allowed for the simultaneous collection and analysis of

numerical and qualitative data to provide a comprehensive understanding of the research problem (Creswell & Plano Clark, 2021).

➤ *Study Population*

The target population of this study was youths within the age range of 15 – 35 residing in Benin City, a major urban center with a diverse youth population and varying socio-demographic characteristics. This age range aligns with the definition according to the African Union, 2022.

➤ *Sample Size*

The sample size of this study was calculated using the Cochran's formula for unknown populations which produced an initial figure of 384 and final figure of 427 after correction for non-response.

➤ *Sampling Technique*

This study employed a stratified random sampling technique to ensure fair and proportionate representation of the different ages between 15 – 35 (e.g. 15 – 20, 21 – 25, 26 – 30, 31 – 35), gender, and educational level.

➤ *Instrument of Study*

The primary instrument of data collection for this study was a structured self-administered questionnaire developed by the researcher. The questionnaire was organized into five sections: Section A covered socio-demographic characteristics; Section B assessed prevalence and patterns of e-cigarette use; Section C measured health perceptions regarding vaping; Section D examined substance use patterns and associations; and Section E evaluated respondents' support for policy measures. The questionnaire included both closed-ended items (multiple-choice, Likert-scale, and binary yes/no formats) and open-ended questions to capture qualitative perspectives. The structured format ensured standardized data collection across all 950 respondents, while the inclusion of open-ended items allowed for richer qualitative insights as required by the convergent parallel mixed-methods design (Creswell & Plano Clark, 2021).

➤ *Validity of the Instrument*

The face and content validity of the research instrument was ascertained by experts.

➤ *Reliability of the Instrument*

The reliability of the instrument was checked with the test retest method. Using this method, the questionnaires were sent to test 20 students of Wellspring University (WU) and a week later, the same number of students at Benson Idahosa University (BIU) were sent the questionnaire to determine the reliability. The Reliability index was calculated using Cronbach's Alpha through the Statistical package for social sciences (SPSS), which gave a good reliability of 0.8 for the questionnaire. The instrument of data collection was therefore found appropriate and reliable for the study.

➤ *Data Collection*

Data were collected using a structured questionnaire, self-administered. The questionnaire was designed to secure relevant socio-demographic and study-specific variables.

These data were entered and analyzed using Microsoft (MS) Excel. Descriptive statistics (frequencies, percentages, means and standard deviation) were used to summarize the data. Inferential statistics were employed where necessary, with the level of significance set at $p < 0.05$.

➤ *Method of Data Analysis*

Data collected from the structured self-administered questionnaires was carefully checked for completeness, consistency, and accuracy before analysis. Completed questionnaires was coded and entered into the Microsoft Excel spreadsheet.

Data cleaning procedures such as checking for missing values, duplicate entries, and incorrect coding was carried out before final analysis. Quantitative data obtained from the questionnaires was analyzed using descriptive and inferential statistical methods as necessary.

Descriptive statistics including frequencies, percentages, means, and standard deviations was used to summarize socio-demographic characteristics, prevalence of vaping, perceptions regarding vaping, and perceived predictors of vaping among respondents. Results was presented using tables, charts, and graphs where appropriate.

Inferential statistics such as Chi-square tests was used to determine associations between categorical variables including age, gender, peer influence, alcohol use, and vaping behavior. Logistic regression analysis was employed to identify significant predictors of vaping among youths. Statistical significance was set at $p < 0.05$.

➤ *Selection Criteria*

Participants were selected based on defined inclusion criteria: youths aged 15–35 years residing in Benin City and willing to provide informed consent. Exclusion criteria included individuals outside the age range, non-residents of Benin City, or those unwilling to participate. For the qualitative component, participants will be purposively selected based on relevance and ability to provide detailed insights.

• *Inclusion Criteria*

Youths aged 15 – 35 years residing in Benin City who consented to participate in the study.

• *Exclusion Criteria*

Individuals outside the age range, non-residents of Benin City, or those unwilling to participate.

- *Ethical Consideration*

Ethical approval was obtained from the ministry of health's ethics board and the institutional review board. Informed consent was obtained from all participants prior to data collection throughout the study.

IV. RESULTS AND DATA ANALYSIS

➤ *Data Analysis*

- *Sociodemographic Characteristics of Respondents*

Table 1 presents the sociodemographic profile of the 950 study participants. The sample was predominantly female (55.7%; n = 529) compared to male (43.5%; n = 413),.

With regard to educational attainment, the largest group comprised those currently enrolled in higher education (39.7%; n = 377%).

Table 1. Sociodemographic Characteristics of Study Respondents (N = 950)

Variable	N	%
Gender		
Female	529	55.7
Male	413	43.5
Prefer not to say	8	0.8
Age Group		
15–20 years	263	27.7
21–25 years	323	34.0
26–30 years	194	20.4
31–35 years	170	17.9
Education Level		
Currently in Higher Institution	377	39.7
Graduate	133	14.0
Completed Higher Institution	114	12.0
Secondary School	111	11.7
OND/NCE	105	11.1
Completed Secondary School	43	4.5
Postgraduate	42	4.4
Currently in Secondary School	25	2.6
Personal Income		
Yes, occasionally	333	35.1
Yes, regularly	319	33.6
No	298	31.4
Living Situation		

Student hostel/hall	288	30.3
With parents/guardians	285	30.0
Alone in flat/room	214	22.5
With friends	127	13.4
Other	36	3.8

Note. N = 950. Percentages may not sum to 100 due to rounding.

➤ **Research Question 1: Prevalence of E-Cigarette Use**

RQ1 sought to determine the prevalence of e-cigarette use among youth aged 15–35 years in Benin City.

• **Awareness**

Awareness of e-cigarettes was documented in 627 respondents (66.0%; 95% CI: 63.0%–69.0%), while 323 (34.0%) reported never having heard of e-cigarettes. This finding indicates substantial awareness of vaping products among Nigerian youth in Benin City, consistent with the documented proliferation of these products through social media and peer networks.

• **Lifetime and Current Prevalence**

Of 943 respondents with valid data on the primary outcome, 351 (37.2%; 95% CI: 34.1%–40.3%) reported lifetime e-cigarette use (i.e., having ever tried an e-cigarette at least once). Among the full sample of 950, 464 (48.8%; 95% CI: 45.7%–52.0%) reported any use in the past 30 days based on the frequency item. Of these, 270 respondents (28.4%) reported using on 0 days in the prior month, 132 (13.9%) used on 1–5 days, 131 (13.8%) on 6–19 days, and 130 (13.7%) on 20–30 days. Thirty-one respondents (3.3%) reported using on 1–2 days, 20 (2.1%) on 6–9 days, 11 (1.2%) on 3–5 days, seven (0.7%) on 10–19 days, and two (0.2%) used every day.

Table 2. Prevalence of E-Cigarette Use Among Youth in Benin City (N = 950)

Prevalence Measure	N	%	95% CI
Awareness of e-cigarettes	627	66.0	63.0–69.0
Lifetime use (ever vaped)	351	37.2	34.1–40.3
Never vaped	592	62.8	59.7–65.9
Any use in past 30 days	464	48.8	45.7–52.0
Close friends use e-cigarettes	499	52.5	49.3–55.7

Note. Lifetime prevalence calculated among n = 943 with valid responses. 95% CI = 95% Confidence Interval. Close friend use includes responses 'Yes,' 'Yes, a few of them,' 'Yes, some of them,' and 'Yes, most of them.'

• **Prevalence by Gender**

Male respondents demonstrated a significantly higher lifetime prevalence (42.4%; 95% CI: 37.7%–47.2%) compared to female respondents (33.1%; 95% CI: 29.1%–37.2%). A Pearson chi-square test confirmed this difference was statistically significant ($\chi^2 = 8.121$, $df = 1$, $p = 0.004$). The crude odds ratio for male gender versus female gender for ever having vaped was 1.49 (95% CI: 1.13–1.97), indicating that males were approximately 49% more likely to have tried e-cigarettes than females.

• **Prevalence by Age Group**

Lifetime prevalence varied significantly across age groups ($\chi^2 = 18.135$, $df = 3$, $p = 0.0004$). The highest prevalence was observed in the 31–35 year age group (47.1%; 95% CI: 39.6%–54.6%), followed by the 26–30 year group (40.8%; 95% CI: 33.9%–47.8%), the 15–20 year group (38.5%; 95% CI: 32.7%–44.4%), and the 21–25 year group (28.7%; 95% CI: 23.8%–33.7%). The finding that the youngest (15–20 years) and oldest (31–35 years) cohorts showed higher prevalence than the 21–25-year group suggests a non-linear age relationship, possibly reflecting earlier initiation patterns in adolescents and greater cumulative exposure in older adults.

Table 3. E-Cigarette Lifetime Prevalence by Gender and Age Group

Subgroup	N	Ever Vaped (n)	Prevalence (%)	95% CI
Gender				
Male	410	174	42.4	37.7–47.2
Female	525	174	33.1	29.1–37.2
Age Group				
15–20 years	262	101	38.5	32.7–44.4
21–25 years	320	92	28.7	23.8–33.7
26–30 years	191	78	40.8	33.9–47.8
31–35 years	170	80	47.1	39.6–54.6

Note. Chi-square test gender: $\chi^2(1) = 8.121$, $p = 0.004$; Age: $\chi^2(3) = 18.135$, $p = 0.0004$.

- *Age of Initiation and Reason for First Use*

Among respondents who reported having ever tried e-cigarettes, age of initiation data were analysed from structured and free-text responses. A significant proportion reported initiating use before age 15 ($n = 102$), with others reporting initiation between ages 15–17 ($n = 82$), 18–20 ($n = 85$), and above 20 ($n = 122$). These data indicate that a considerable segment of the ever-vaping cohort first experimented with e-cigarettes during adolescence, underscoring the urgency of early prevention interventions.

With respect to reasons for first use ($n = 706$), the dominant motivators were peer influence (31.7%; $n = 224$), curiosity (24.1%; $n = 170$), flavour appeal (22.0%; $n = 155$), social acceptance or desire to appear cool (14.2%; $n = 100$), and stress or mental health relief (11.6%; $n = 82$). These findings highlight the multi-factorial nature of vaping initiation and underscore the primacy of social and environmental influences in the Nigerian youth context.

➤ *Research Question 2: Substance Use Associations*

Section D data documented patterns of concurrent substance use. Overall, 34.6% ($n = 329$) of respondents reported no use of alcohol, tobacco, or cannabis. Among substance users, 41.3% ($n = 392$) reported alcohol use, 15.2% ($n = 144$) reported tobacco use, and 25.5% ($n = 242$) reported cannabis use. Among ever-vapers specifically, substance co-occurrence rates were higher: 53.8% used alcohol, 21.4% used tobacco, and 27.9% used cannabis, compared to 33.2%, 11.2%, and 24.2% among never-vapers, respectively.

The association between alcohol use and current vaping was highly significant ($\chi^2 = 184.54$, $df = 1$, $p < 0.001$), supporting rejection of H_{05} . The crude OR for current vaping among alcohol users versus non-users was 2.67 (95% CI: 2.01–3.55). Tobacco use (OR = 2.08) and cannabis use (OR = 1.78) were also significantly associated with current vaping in bivariate analyses. In the adjusted Model 3 (including all three substances and sociodemographic covariates), alcohol use remained the strongest independent predictor of current vaping (aOR = 2.31; 95% CI: 1.69–3.16; $p < 0.001$), followed by tobacco use (aOR = 1.71; 95% CI: 1.13–2.59; $p = 0.012$) and cannabis use (aOR = 1.44; 95% CI: 1.01–2.06; $p = 0.045$).

Table 5. Substance Use Patterns and Association with E-Cigarette Use (N = 950)

Substance	Full Sample n (%)	Ever-Vapers n (%)	Never-Vapers n (%)	χ^2 (p-value)
Alcohol use	392 (41.3)	189 (53.8)	196 (33.2)	184.54 (<0.001)
Tobacco cigarette use	144 (15.2)	75 (21.4)	66 (11.2)	—* (<0.001)
Cannabis use	242 (25.5)	98 (27.9)	143 (24.2)	—* (<0.001)
No substance use	329 (34.6)	—	—	—

Note. Chi-square statistics for tobacco and cannabis are reported with $p < 0.001$ based on logistic regression model outputs. Percentages for ever/never vapers are within-group column percentages.

➤ *Summary of Hypothesis Testing*

Table 9. Summary of Hypothesis Tests

H	Hypothesis	Test	Statistic	P	Decision & Interpretation
H ₀₁	No association between age group and e-cigarette use	Chi-square	$\chi^2(3) = 18.14$	0.0004	REJECT H ₀ . Significant age variation; 31–35 years highest risk.
H ₀₂	No association between sex and e-cigarette use	Chi-square	$\chi^2(1) = 8.12$	0.004	REJECT H ₀ . Males significantly more likely to have vaped (OR = 1.49).
H ₀₃	No association between peer e-cigarette use and initiation	Chi-square	$\chi^2(1) = 0.26$	0.612	FAIL TO REJECT H ₀ (quantitative). Qualitative data reveals social influence operates beyond direct peer use.
H ₀₄	Harm perception not associated with e-cigarette use	Mann-Whitney U	U = 87,386	<0.001	REJECT H ₀ . Lower lung harm perception significantly associated with ever vaping.
H ₀₅	No association between alcohol use and current vaping	Chi-square	$\chi^2(1) = 184.54$	<0.001	REJECT H ₀ . Alcohol use strongly predicts current vaping (OR = 2.67; aOR = 2.31).

Note. *df* = degrees of freedom. All tests conducted at $\alpha = 0.05$ significance level.

V. DISCUSSION OF FINDINGS

➤ *Prevalence of E-Cigarette Use (Research Question 1)*

This study found a lifetime e-cigarette use prevalence of 37.2% (95% CI: 34.1%–40.3%) among youth aged 15–35 years in Benin City. This figure is substantially higher than the 7.9% ever-use prevalence reported by Erinoso et al. (2021) for Nigerian adolescents and young adults, and also exceeds the 5.8%–20% range summarized in the scoping review by Adegbile et al. (2024). The divergence likely reflects differences in sampling frame (this study included older youth up to age 35, who have had greater cumulative exposure), measurement approach, and the rapidly changing product availability landscape in urban Benin City since 2021.

➤ *Substance Use Associations (Research Question 2)*

The study found strong associations between e-cigarette use and alcohol use (aOR = 2.31; $p < 0.001$), tobacco use (aOR = 1.71; $p = 0.012$), and cannabis use (aOR = 1.44; $p = 0.045$). These findings strongly agree with Lyzwinski et al. (2022), who reported that 82.6% of e-cigarette users concurrently used additional nicotine products, and with Oyapero et al. (2023), who documented significant associations between vaping and polysubstance use among Nigerian young adults. The finding that alcohol use was the single strongest independent predictor of current vaping (aOR = 2.31) is consistent with the Gateway Theory reviewed in Chapter Two, which posits that use of one substance increases the likelihood of subsequent use of others. It also agrees with Glantz and Bareham (2018), who documented that e-cigarette users engage in broader risk behaviour clusters. Collectively,

these results confirm that e-cigarette use in Benin City is not a standalone behaviour but occurs within a broader substance-use context, a finding that aligns consistently with the reviewed empirical literature.

VI. CONCLUSION

The findings of this study unequivocally establish that electronic cigarette use among youth in Benin City, Nigeria, constitutes a significant and growing public health concern. A lifetime prevalence of 37.2%, representing over one-third of the sampled youth population indicates that vaping is no longer a peripheral or experimental phenomenon in this context but has achieved substantial penetration across demographic subgroups. The high level of product awareness (66.0%), the young age of initiation, and the close association between e-cigarette use and other substance use behaviours collectively point to a permissive social and regulatory environment that facilitates early and sustained uptake.

The strong association between polysubstance use and e-cigarette uptake confirms that vaping in this population occurs within a broader risk behaviour context rather than as a harm reduction tool. The demographic profile of higher-risk users, older male youth with established substance use patterns, challenges stereotypes of vaping as primarily an adolescent phenomenon and suggests the need for population-spanning rather than age-segmented interventions.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made to policymakers, health educators, healthcare providers, community stakeholders, and researchers:

- The Federal Government of Nigeria, through the National Agency for Food and Drug Administration and Control (NAFDAC) and the Nigerian Tobacco Control Act (2015), should develop and enforce specific, comprehensive regulations governing the sale, advertising, and importation of e-cigarettes and related products, including minimum age restrictions, point-of-sale restrictions, and product labelling requirements.
- The highest-priority intervention identified by respondents (71.7%) was school-based public awareness campaigns. The Edo State Ministry of Health and Ministry of Education should jointly develop a youth-targeted health education programme on e-cigarette risks, to be integrated into secondary school and tertiary institution curricula.
- Parents and guardians should be equipped with information about e-cigarettes and their risks, enabling them to engage in open, informed conversations with adolescents and young adults about substance use. Community parent education programmes should be implemented by Local Government Authorities and community health extension workers.

➤ Research Recommendations

- Longitudinal studies are needed to establish temporal relationships between identified predictors and vaping initiation, moving beyond the cross-sectional design limitations of this study.
- Future research should employ biomarker-validated vaping status (e.g., urinary cotinine) to supplement self-reported data and reduce potential underreporting bias.

LIMITATIONS OF THE STUDY

Several limitations must be acknowledged in interpreting the findings of this study:

- Cross-sectional design: The study employed a cross-sectional design, which precludes causal inference. The associations between predictors and e-cigarette use identified in logistic regression models represent associations, not causal relationships. Longitudinal data would be required to establish temporality.
- Self-report bias: All data were self-reported, creating potential for social desirability bias, recall bias, and underreporting, particularly for stigmatised behaviours such as cannabis use. The actual prevalence of vaping and substance use may be higher than documented.

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