INTRODUCTION
Cigarettes and alcohol are major sources of public health concern, affecting all countries worldwide. About 1.1 billion are current tobacco users, while 2.3 billion people are drinking alcohol. They are addictive and pose serious health risks such as cardiovascular diseases, neurological problems, and different types of cancers, including head and neck cancers (HNC). While they can individually cause these health problems, combining the two habits has a synergistic effect and substantially increases the risks, and doing so during adolescence presents even greater health risks.

Considering that most adult cigarette and alcohol users commence during adolescence, it is important that effective interventions prevent these vulnerable populations from initiating the habits and quitting if
they have started. These interventions should address the factors associated with the habits among youths and adolescents. Some of the associated factors include social factors (peer and parental influence, low socioeconomic status), psychological factors (mental health problems, impulsivity, self-esteem), and low harm perception associated with these habits.\textsuperscript{1,3,7–10}

Several studies on cigarette and alcohol use among Nigerian secondary school students have recorded varying prevalences.\textsuperscript{10–14} However, a general trend is that the practices have increased in the last decade and are now public health problems requiring urgent interventions.\textsuperscript{10–14} Although different studies have assessed factors influencing cigarette and alcohol use among secondary school students in different parts of Nigeria, most are limited to small communities and cities, thus, limiting their generalizability. Nationally representative data about this vulnerable population is needed to develop effective national policies and interventions, which are currently lacking.

Hence, this study aimed to provide nationally representative empiric information on the prevalence of cigarette and alcohol use and factors (socio-demographic, school-based characteristics, and harm perceptions) predicting both habits among secondary school students in Nigeria.

**METHODS**

**Study design**

This study was a descriptive cross-sectional survey of secondary school students in Nigeria.

**Study area and population**

Nigeria is the most populous black nation, with an estimated population of over 200 million people.\textsuperscript{15} The country also has one of the highest proportions of adolescents globally, with an estimated 22% of the total population.\textsuperscript{15} Nigeria is divided into six geopolitical zones: North-East, North-West, North-Central (making up the northern region), and South-West, South-South, and South-East (making up the southern region).\textsuperscript{16} Nigeria has 36 states and the Federal Capital Territory (FCT).\textsuperscript{16} The secondary schools comprise six classes (three junior classes - JSS1-3 and three senior classes SSS1-3). The schools are either government-owned (public schools) or owned by private individuals or institutions (private schools). Most of the schools have both gender (mixed schools), but a significant proportion of the schools are single-gender based (girls-only and boys-only). The official age of entry into the JSS 1 class is 12 years,\textsuperscript{17,18} although many students get into this class at younger ages (9-11 years) by either enrolling in the basic schools early or skipping some classes in the primary schools.\textsuperscript{18}

**Ethical considerations**

Ethical approval to conduct this study was obtained from the University of Ibadan/University College Hospital Ethical Review Board (Ref: UI/EC/18/0077). Permission was also obtained from the participating schools’ principals. Parental informed consent was obtained from the parents/guardians of the selected participants, after which the students also assented to participate in the study.

**Study instrument**

The study instrument was a self-administered semi-structured questionnaire developed by reviewing relevant literature on tobacco and alcohol use among adolescents.\textsuperscript{10,12,19} The questionnaire was then revised by tobacco control experts and subsequently pretested among conveniently selected secondary school students who were not part of those selected for the study.

The questionnaire was used to obtain information about the participants’ sociocultural characteristics (age, gender, tribe, religion, and family background); school-related characteristics (school location – northern vs southern Nigeria, ownership – private vs public, set-up – boys-only vs girls-only vs mixed, mode of the studentship – day vs boarding, classes – SSS 1-3). Others were participants’ tobacco harm perception, cigarette and alcohol use status.

The cigarette smoking status was assessed using the question: “Are you currently smoking cigarettes?” and the options were “No, I have never smoked”, “No, I have quit smoking”, “Yes, but I am trying to quit” and “Yes, not trying to quit”. Based on their responses, those who chose “No, I have never smoked” were categorised as “Never smokers” while others were termed “Ever smokers”. Furthermore, those who chose “Yes, but I am trying to quit” and “Yes, not trying to quit” were categorised as “Current smokers”.

Similarly, alcohol use status was assessed with the question: “Are you currently drinking alcohol?” and the options were “No, I have never drunk alcohol”, “No, I have stopped drinking”, “Yes, but I am trying to quit drinking” and “Yes, not trying to quit”. Based on their responses, those who chose “No, I have never drunk alcohol” were categorised as having “No lifetime history of drinking alcohol”. Others were classified as having a “lifetime history of alcohol use”. Those who chose “Yes, but I am trying to quit” and “Yes, not trying to quit” were categorised as “current alcohol users”.

Tobacco harm perception was assessed with the question: “Tobacco use can cause head and neck cancer”, and the responses were “Definitely yes”, “Probably yes”, “Probably not”, and “Definitely not”. The participants
were classified as having “High”, “Moderate”, “Low”, and “No” harm perception, respectively.

**Sampling**
The multistage sampling technique was employed for this study. The first stage involved the selection of five geopolitical zones (North-East, North-West, North-Central, South-West, South-South) from the six zones in Nigeria using the simple random sampling technique. Thirteen schools were subsequently selected from the five zones in the second stage with a minimum of two schools selected from each of the five zones. Finally, all students in SSS1 – 3 classes of the selected schools were recruited for the study.

**Data collection**
Data were collected from Oyo, Edo, Bauchi, Sokoto, Osun, and Benue states between November 2016 to January 2018. A total of 3,000 SS1–3 students were approached in the selected schools, but 2,754 (91.8%) students agreed to participate in the study. Written parental informed consent and assent were obtained from all consenting students before participating in the study. All 2,754 selected participants were given a questionnaire to fill out, but 2,701 participants (98.1%) returned theirs. The filled questionnaires were screened for completeness and appropriateness of responses, and 171 questionnaires were discarded because they were not appropriately filled, leaving 2,530 (93.7%) that were analysed.

**Data analysis**
Data from 2,530 filled questionnaires were analysed using SPSS version 25 software. Current cigarette smoking and alcohol use were the primary outcome variables, while sociodemographic and school-related characteristics, tobacco harm perception, lifetime history of alcohol and cigarette use were explanatory variables. The frequency distributions of all variables were determined. Pearson’s Chi-square tests were conducted to assess the association between current cigarette and alcohol use and the categorical independent variables (sex, religion, family background, tribe, school location and ownership, mode of studentship, class level, lifetime history of cigarette and alcohol use, tobacco harm perception). Independent Samples t-test was also conducted to assess their association with the continuous variable (age). Factors that were significantly associated with current cigarette smoking and current alcohol use at p < 0.05 at bivariate analysis were subsequently included in the Binomial logistic regression modelling for both current cigarette smoking and alcohol use, respectively. The level of statistical significance for all the tests was set at p < 0.05.

**RESULTS**

**Sociodemographic and school-related characteristics**
The participants’ age ranged from 12 – 24 years, with a mean age (±SD) of 16.3 (±2.0) years. More than half were males (56.6%), Christians (61.1%), from a monogamous family (55.0%), studying in northern Nigeria (51.8%), and attending public schools (73.5%). Those from the Yoruba ethnic group were 34.9%, 21.9% were boarding students, 21.8% were in boys-only schools, and 33.5% were in SSS 3 class. (Table 1)

**Participants’ harm perception of tobacco and alcohol use**
A little over one-third (38.3%) had a high harm perception for tobacco use as a risk for head and neck cancer (HNC). Furthermore, only 16.6%, 4.9%, and 15.1% included cigarette smoking, snuff (smokeless tobacco), and alcohol use in the top three causes of HNC, respectively. (Table 2)

**Prevalence of cigarette smoking and alcohol use**
The prevalence (95% CI) of lifetime history and current alcohol use were 21.0% (95% CI: 19.4-22.7) and 15.6% (14.2-17.1), respectively. Regarding their cigarette smoking habit, 11.1% (95% CI: 9.9-12.4) had a lifetime history of cigarette smoking (ever-cigarette smokers), while 8.4% (95% CI: 7.3-9.5) were current cigarette smokers. Among current cigarette smokers (n=203), 16.3% had made past quit attempts, albeit unsuccessfully. (Table 2)

Following a sub-analysis of the outcome variables based on gender, the prevalence of males involved in lifetime alcohol use was 25.5% (95% CI: 23.3-27.9), current alcohol use was 18.6% (95% CI: 16.6-20.7), lifetime cigarette smoking was 15.4% (95% CI: 13.6-17.4), and current cigarette smoking was 11.9% (95% CI: 10.2-13.7). As for females, the prevalences for lifetime alcohol use was 15.1% (95% CI: 13.1-17.4), current alcohol use was 11.6% (95% CI: 9.8-13.6), lifetime cigarette smoking was 5.0% (95% CI: 3.8-6.5), and current cigarette smoking was 3.3% (95% CI: 2.4-4.6).

**Factors associated with current cigarette smoking**
Bivariate analysis showed that a higher proportion (11.2%) of participants attending schools in northern Nigeria were current cigarette smokers compared to those (5.3%) attending schools in the southern part of the country (p < 0.001). The proportion of current cigarette smokers was also higher among participants attending private schools (12.3%) compared to public schools (6.9%) (p = 0.042); boarding students (14.0%) compared to day students (6.7%) (p < 0.001); and among males (11.9%) compared to females (3.3%) (p
There was a dose-response relation between the participants’ tobacco perception with current cigarette smoking. Those (16.0%) with the no harm perception – “Definitely not” were most likely to be current smokers compared to the others (p < 0.001). Similarly, a higher proportion of participants with lifetime history (26.8%) and current alcohol use (33.4%) were current cigarette smokers, compared to never (3.4%) and non-current (3.7%) alcohol users, respectively (p < 0.001). Other factors associated with current cigarette smoking were school set-up (p = 0.004), religion (p < 0.001), and tribe (p < 0.001). (Table 3)

However, logistic regression modelling showed that the following factors were independently associated with being a current cigarette smoking: studying in northern Nigeria (aOR: 1.94; 95% CI: 1.10–3.44), attending private schools (aOR: 1.56; 95% CI: 1.03–2.38), being a boarding student (aOR: 1.75; 95% CI: 1.15–2.69), male-gender (aOR: 3.03; 95% CI: 1.80–5.10), current alcohol use (aOR: 12.50; 95% CI:8.70–18.18), having ‘no’ (aOR: 2.59; 95% CI: 1.58–4.26) or ‘low’ tobacco harm perception (aOR: 2.04; 95% CI: 1.18–3.53). (Table 5)

### Table 1: Sociodemographic and school-related characteristics of the participants

| Characteristics                        | Frequency | Percentage |
|----------------------------------------|-----------|------------|
| **Age (n=2,509)**                      |           |            |
| Mean age (±SD)                         | 16.3 (±2.0)|            |
| **Age groups (n=2,509)**               |           |            |
| 12-14 years                            | 372       | 14.8%      |
| 15-19 years                            | 1999      | 79.7%      |
| 20-24 years                            | 138       | 5.5%       |
| **Sex (n=2,506)**                      |           |            |
| Male                                   | 1418      | 56.6%      |
| Female                                 | 1088      | 43.4%      |
| **Religion (n=2,516)**                 |           |            |
| Christianity                           | 1537      | 61.1%      |
| Islam                                  | 959       | 38.1%      |
| Other religion                         | 20        | 0.8%       |
| **Family background (n=2,376)**        |           |            |
| Polygamous                             | 743       | 31.3%      |
| Single parent                          | 326       | 13.7%      |
| Monogamous                             | 1307      | 55.0%      |
| **Tribe (n=2,530)**                    |           |            |
| Yoruba                                 | 884       | 34.9%      |
| Hausa                                  | 599       | 23.7%      |
| Igbo                                   | 250       | 9.9%       |
| Other tribes (Tiv, Idoma, Edo, Ijaw)   | 797       | 31.5%      |
| **Location of school (n=2,530)**       |           |            |
| Northern Nigeria                       | 1311      | 51.8%      |
| Southern Nigeria                       | 1219      | 48.2%      |
| **School ownership (n=2,530)**         |           |            |
| Public                                 | 1860      | 73.5%      |
| Private                                | 670       | 26.5%      |
| **Mode of studentship (n=2,530)**      |           |            |
| Boarding                               | 554       | 21.9%      |
| Day                                    | 1976      | 78.1%      |
| **School set-up (n=2,530)**            |           |            |
| Mixed                                  | 1749      | 69.1%      |
| Boys only                              | 551       | 21.8%      |
| Girls only                             | 230       | 9.1%       |
| **Class (n=2,439)**                    |           |            |
| SS3                                    | 817       | 33.5%      |
| SS2                                    | 831       | 34.1%      |
| SS1                                    | 791       | 32.4%      |

n – Total number of participants
### Table 2: Participants’ cigarette smoking, alcohol use, and knowledge of HNC risk factors

| Variables                                                                 | Frequency | Percentage (%95CI) |
|---------------------------------------------------------------------------|-----------|--------------------|
| **Lifetime history of alcohol use (n=2,432)**                           |           |                    |
| No                                                                        | 1921      | 79.0% (77.3-80.6)  |
| Yes                                                                       | 511       | 21.0% (19.4-22.7)  |
| **Current alcohol use (n=2,432)**                                        |           |                    |
| No                                                                        | 2052      | 84.4% (82.9-85.8)  |
| Yes                                                                       | 380       | 15.6% (14.2-17.1)  |
| **Lifetime history of cigarette smoking (n=2,427)**                      |           |                    |
| Never smoked                                                              | 2157      | 88.9% (87.6-90.1)  |
| Ever smoked                                                               | 270       | 11.1% (9.9-12.4)   |
| **Current cigarette smoking (n=2,427)**                                  |           |                    |
| No                                                                        | 2024      | 84.4% (82.9-85.8)  |
| Yes                                                                       | 203       | 8.4% (7.3-9.5)     |
| **Willing to Quit smoking (n=203)**                                       |           |                    |
| No                                                                        | 170       | 83.7% (77.9-88.5)  |
| Yes                                                                       | 33        | 16.3% (11.5-22.1)  |
| **Tobacco harm perception (n=2,227)**                                    |           |                    |
| Definitely not                                                            | 416       | 18.7% (17.1-20.4)  |
| Probably not                                                              | 317       | 14.2% (12.8-15.8)  |
| Probably yes                                                              | 642       | 28.8 (27.0-30.8)   |
| Definitely yes                                                            | 852       | 38.3 (36.2-40.3)   |
| **Perception of cigarette smoking as one of the top three causes of HNC (n=2,530)** |           |                    |
| No                                                                        | 2110      | 83.4% (81.9-84.8)  |
| Yes                                                                       | 420       | 16.6% (15.2-18.1)  |
| **Perception of smokeless tobacco (snuff) as one of the top three causes of HNC (n=2,530)** |           |                    |
| No                                                                        | 2405      | 95.1% (94.1-95.9)  |
| Yes                                                                       | 125       | 4.9% (4.1-5.9)     |
| **Perception of alcohol use as one of the top three causes of HNC (n=2,530)** |           |                    |
| No                                                                        | 2148      | 84.9% (83.4-86.3)  |
| Yes                                                                       | 382       | 15.1% (13.7-16.6)  |

*n – Total number of participants; 95%CI: 95% Confidence Interval; HNC – Head and Neck Cancer*

### Table 3: Factors associated with current cigarette smoking among the participants

| Variables                | Current cigarette smoking | p-value |
|--------------------------|----------------------------|---------|
|                          | Yes (8.4%)                 | No (91.6%) |         |
| **Location of school**   |                            |          |         |
| Northern Nigeria         | 141 (11.2%)                | 1118 (88.8%) | <0.001* |
| Southern Nigeria         | 62 (5.3%)                  | 1106 (94.7%) |         |
| **School ownership**     |                            |          |         |
| Public                   | 123 (6.9%)                 | 1655 (93.1%) | <0.001* |
| Private                  | 80 (12.3%)                 | 569 (87.7%)  |         |
| **Mode of studentship**  |                            |          |         |
| Boarding                 | 76 (14.0%)                 | 465 (86.0%)  | <0.001* |
| Day                      | 127 (6.7%)                 | 1759 (93.3%) | 0.004*  |
| **School set-up**        |                            |          |         |
| Mixed                    | 145 (8.6%)                 | 1544 (91.4%) |         |
| Boys only                | 52 (10.0%)                 | 466 (90.0%)  |         |
| Girls only               | 6 (2.7%)                   | 214 (97.3%)  | <0.001* |
| **Sex**                  |                            |          |         |
| Male                     | 161 (11.9%)                | 1193 (88.1%) | <0.001* |
| Female                   | 35 (3.3%)                  | 1015 (96.7%) |         |
| **Religion**             |                            |          |         |
| Christianity             | 86 (5.8%)                  | 1386 (94.2%) | <0.001* |
| Islam                    | 107 (11.6%)                | 815 (88.4%)  | <0.001* |
| **Tribe**                |                            |          |         |
| Yoruba                   | 64 (7.5%)                  | 793 (92.5%)  | <0.001* |
| Hausa                    | 84 (14.7%)                 | 489 (85.3%)  |         |
| Igbo                     | 12 (5.0%)                  | 227 (95.0%)  |         |
| Others                   | 43 (5.7%)                  | 715 (94.3%)  | <0.001* |
| **Harm perception of tobacco use**                                     |                            |          |         |
| Definitely not           | 65 (16.0%)                 | 340 (84.0%)  | <0.001* |
| Probably not             | 36 (11.6%)                 | 274 (88.4%)  |         |
| Probably yes             | 44 (7.0%)                  | 581 (93.0%)  |         |
| Definitely yes           | 40 (4.7%)                  | 805 (95.3%)  |         |
| **Lifetime history of alcohol use**                                    |                            |          |         |
| Never drinker            | 65 (5.4%)                  | 1847 (96.6%) | <0.001* |
| Ever drinker             | 136 (26.8%)                | 371 (73.2%)  | <0.001* |
| **Current alcohol use**   |                            |          |         |
| No                       | 75 (3.7%)                  | 1967 (96.3%) |         |
| Yes                      | 126 (33.4%)                | 251 (66.6%)  |         |

*Statistically significant*
Table 4: Factors associated with current alcohol use among the participants

| Variables                  | Current alcohol intake (%) | p-value |
|----------------------------|-----------------------------|---------|
|                            | Yes (15.6%)                 | No (84.4%) |
| Location of school         |                             |         |
| Northern Nigeria           | 218 (17.2%)                 | 1047 (82.8%) | 0.023* |
| Southern Nigeria           | 162 (13.9%)                 | 1005 (86.1%) |
| Age                        |                             |         |
| 12-14 years                | 37 (10.2%)                  | 326 (89.8%) | 0.005* |
| 15-19 years                | 314 (16.4%)                 | 1604 (83.6%) |
| 20-24 years                | 26 (19.8%)                  | 105 (80.2%) |
| Sex                        |                             |         |
| Male                       | 253 (18.6%)                 | 1107 (81.4%) | <0.001* |
| Female                     | 122 (11.6%)                 | 929 (88.4%) |
| Harm perception of tobacco use |                         |         |
| Definitely not             | 89 (21.8%)                  | 320 (78.2%) | <0.001* |
| Probably not               | 60 (19.3%)                  | 251 (80.7%) |
| Probably yes               | 86 (13.7%)                  | 540 (86.3%) |
| Definitely yes             | 109 (12.9%)                 | 736 (87.1%) |
| Lifetime history of cigarette smoking |               |         |
| Never smoker               | 234 (10.9%)                 | 1918 (89.1%) | <0.001* |
| Ever smoker                | 143 (53.6%)                 | 124 (46.4%) |
| Current cigarette smoking  |                             |         |
| No                         | 251 (11.3%)                 | 1967 (88.7%) | <0.001* |
| Yes                        | 126 (62.7%)                 | 75 (37.3%) |

*Statistically significant

Table 5: Predictors of current cigarette smoking among the study participants

| Predictors                  | Current cigarette smoking | aOR   | 95% CI     | p-value |
|-----------------------------|---------------------------|-------|------------|---------|
| Location of school          |                           |       |            |         |
| Northern Nigeria            |                           | 1.94  | 1.10 – 3.44 | 0.023*  |
| Southern Nigeria            |                           | Ref   |            |         |
| School ownership            |                           |       |            |         |
| Private                     |                           | 1.56  | 1.03 – 2.38 | 0.036*  |
| Public                      |                           | Ref   |            |         |
| Mode of studentship         |                           |       |            |         |
| Boarding                    |                           | 1.75  | 1.15 – 2.69 | 0.010*  |
| Day                         |                           | Ref   |            |         |
| Sex                         |                           |       |            |         |
| Male                        |                           | 3.03  | 1.80 – 5.10 | <0.001* |
| Female                      |                           | Ref   |            |         |
| Tobacco harm perception     |                           |       |            |         |
| Definitely not              |                           | 2.59  | 1.58 – 4.26 | <0.001* |
| Probably not                |                           | 2.04  | 1.18 – 3.53 | 0.011*  |
| Probably yes                |                           | 1.41  | 0.86 – 2.33 | 0.176   |
| Definitely yes              |                           | Ref   |            |         |
| Current alcohol use         |                           |       |            |         |
| Yes                         |                           | 12.50 | 8.70 – 18.18 | <0.001* |
| No                          |                           | Ref   |            |         |
| School set-up               |                           |       |            |         |
| Mixed                       |                           | 0.96  | 0.34-2.70   | 0.955   |
| Boys only                   |                           | 1.09  | 0.35-3.46   |         |
| Girls only                  |                           | Ref   |            |         |
| Religion                    |                           |       |            |         |
| Christianity                |                           | 0.78  | 0.47-1.29   | 0.337   |
| Islam                       |                           | Ref   |            |         |
| Tribe                       |                           |       |            |         |
| Yoruba                      |                           | 1.39  | 0.71-2.73   | 0.337   |
| Igbo                        |                           | 0.70  | 0.28-1.78   | 0.458   |
| Other tribes                |                           | 0.88  | 0.48-1.62   | 0.691   |
| Hausa                       |                           | Ref   |            |         |

aOR: Adjusted Odds Ratio; 95%CI: 95% Confidence Interval; *Statistically significant
Factors associated with current alcohol use

A higher proportion of participants attending schools in northern Nigeria (17.2%) compared to southern Nigeria (13.9%) (p = 0.023), males (18.6%) compared to females (11.6%) (p < 0.001), ever cigarette smokers (53.6%) compared to never smokers (10.9%) (p<0.001) and current cigarette smokers (62.7%) compared to non-smokers (11.3%) (p<0.001) were current alcohol users. Similarly, those aged 20-24 years old (19.8%) and those with no harm perception to tobacco use (21.8%) had the highest proportion of current alcohol users compared to their counterparts. (Table 4)

However, the logistic regression modelling revealed that the predictors of current alcohol use were male gender (aOR: 1.32; 95% CI: 1.01–1.72) and current cigarette smoking (aOR: 12.5; 95% CI: 8.77–17.86). (Table 6)

DISCUSSION

Like many African countries, Nigeria is considered to be in the first phase of the tobacco epidemic, with a relatively low prevalence of cigarette smoking among adults, youths, and adolescents, compared to some other low- and middle-income countries. The last (2008) Global Youth Tobacco Survey (GYTS) for Nigeria conducted in five cities across five geopolitical zones, reported a prevalence of 4.2% for current cigarette smoking among school-going adolescents. Hence, having a prevalence of 8.4% in this study suggests that cigarette smoking has increased among Nigerian secondary school students. The GYTS study was among adolescents between 13 and 15 years old, while this study was conducted among senior secondary school students, with their ages ranging from 12 to 24 years. While this may have contributed to the difference in the prevalence, other literature supports that the prevalence of cigarette smoking has increased significantly in the last decade.

Several factors have been reported as the reasons for the increasing trend of cigarette smoking among Nigerian adolescents, and some of these include the decision of the Tobacco Industry (TI) to make Africa, including Nigeria, their next major tobacco market. The TI is aggressive with its marketing strategies with lots of Tobacco Advertising Promotion and Sponsorship (TAPS). The lack of implementation of tobacco control policies such as the ban on TAPS, sales to minors, location of the point of sales close to schools, and sales of single sticks of cigarettes, are also major contributory factors.

The national prevalence of 8.4% (95% CI: 7.3-9.5) of current cigarette smokers in this study is comparable to the pool prevalence of 9.0%, reported in the meta-analysis of 26,875 school-going adolescents from countries in East Africa conducted in 2019. It is also comparable to the national prevalence of 6.8% (95% CI: 4.1-11.0) in Cameroon, 7.4% (95% CI: 5.6-9.6) in Comoros, and 9.0% (95% CI: 7.6-10.7) in Gabon. However, it is higher than the national prevalence of 1.0% (95% CI: 0.6-1.8) in Tanzania, 2.8% (95% CI: 1.8-3.8) in South Africa, and 4.0% (95% CI: 3.3-4.7) in Botswana.

Table 6: Predictors of current alcohol use among the study participants

| Predictors                               | aOR  | 95% CI          | p-value |
|------------------------------------------|------|-----------------|---------|
| Sex                                      |      |                 |         |
| Male                                     | 1.32 | 1.01–1.72       | 0.046*  |
| Female                                   | Ref  |                 |         |
| Current cigarette smoking                |      |                 |         |
| Yes                                      | 12.50| 8.77–17.86      | <0.001* |
| No                                       | Ref  |                 |         |
| Location of school                       |      |                 |         |
| Northern Nigeria                         | 1.08 | 0.82–1.41       | 0.592   |
| Southern Nigeria                         | Ref  |                 |         |
| Age                                      |      |                 |         |
| 12-14 years                              | 0.62 | 0.32–1.20       | 0.152   |
| 15-19 years                              | 1.10 | 0.63–1.92       | 0.740   |
| 20-24 years                              | Ref  |                 |         |
| Harm perception of tobacco use           |      |                 |         |
| Definitely not                           | 1.25 | 0.88–1.79       | 0.216   |
|Probably not                             | 1.25 | 0.85–1.83       | 0.264   |
|Probably yes                             | 0.95 | 0.68–1.32       | 0.761   |
| Definitely yes                           | Ref  |                 |         |

aOR: Adjusted Odds Ratio; 95%CI: 95% Confidence Interval;*Statistically significant (p<0.05)
that have reported tobacco use. Thus, we recommend that counsellors in Nigeria introduce into the school curriculum. Similarly, the educational activities to increase students’ perception adolescents have toward tobacco smoking. One of the main strategies of the TI is to suppress the perception of risk and create a positive perception of tobacco smoking among unsuspecting children and adolescents by portraying smoking as good and harmless. Hence, policies against TAPS in Nigeria have to be implemented to limit the TI’s influence on children and adolescents.

Educational activities to increase students’ harm perception and prevent tobacco use should be introduced into the school curriculum. Similarly, the school counsellors, who are responsible for students’ psychological well-being, can play vital roles in providing needed tobacco-related counselling to the students. School counsellors can be trained to counsel students on healthy behaviours, especially on avoiding tobacco use. Thus, we recommend that counsellors in Nigerian secondary schools be prepared to undertake these activities.

There is a lack of studies focused on school-related factors as predictors of cigarette smoking among secondary school students in Nigeria. A study in Chile assessed the influence of school-related factors on smoking among Chilean adolescents and reported that school bonding, school truancy, and school achievement were associated with smoking among them. But in contrast to this present study, they did not find an association between school type and cigarette smoking. School location, set-up, ownership, and mode of studentship were assessed in this study. It showed that attending schools in northern Nigeria, private schools, and boarding schools were associated with current cigarette smoking after controlling for alcohol use, tobacco harm perception, gender, religion and tribe. For example, while students attending schools in northern Nigeria (a region dominated by the Hausa tribe) were more likely to be current smokers, the Hausa tribe was not independently associated with cigarette smoking. Hence, there may be other environmental factors in those schools that may be responsible for this association. We recommend further studies to understand why these school-related factors were associated with cigarette smoking. School-going adolescents spend many teenage years in schools, especially those in boarding schools. Thus, school-level interventions and policies must be implemented after a thorough understanding of these associated factors.

This study showed a strong association between current cigarette smoking and current alcohol use. This finding agrees with similar studies that have reported strong associations between both habits. Several reasons can be adduced why cigarette smokers are more likely to drink alcohol than non-smokers. Some of the reasons are environmental exposure to these products. Many locations, such as bars and kiosks, where alcohol is sold, also have cigarettes on sale, and vice versa. Hence, there is a likely higher exposure of those who purchase either of the products to the other. Studies have also reported pharmacological interactions between alcohol and nicotine, which may explain the increased use of both products together. Synergistic activation of the reward system in the brain occurs when both products are used together. When nicotine and alcohol are used together, they potentiate the “feel good” feeling that they both offer by further activating the dopamine reward pathway.

The synergistic negative health effect of tobacco and alcohol is a significant challenge and more reasons why both habits must be discouraged among adolescents. By themselves, tobacco and excessive alcohol consumption risk serious health problems like cardiovascular diseases, neurological problems, and cancers. Combining the two increases the users’ risks,
morbidity, and mortality substantially; worst still, if both habits are commenced during adolescence.\textsuperscript{5,37,38} Apart from current cigarette smoking, this study also showed that the male gender was a predictor of alcohol use, which is similar to other studies.\textsuperscript{1,11,39–42} However, some other studies did not record any significant gender difference in alcohol use.\textsuperscript{43,44} And even though this study recorded an association, the odds of males being current alcohol users were only 1.32 times higher than females. As reported by the WHO,\textsuperscript{1} studies from other countries have also shown that while there is a significant gender difference in alcohol consumption between boys and girls, the difference is minimal, especially when compared to the gender difference with tobacco smoking, and this is consistent with the findings from this study.

Most Nigerian cultures are less accommodating to females drinking alcohol than males,\textsuperscript{45} although this is less serious compared to cigarette smoking. Apart from cultural factors, gender differences in the neurobiological make-up between males and females have been reported to increase the risk of alcohol use in males.\textsuperscript{46} Males have greater sensitivity to the rewarding effect of alcohol and develop lesser inhibitory control and sensation-seeking levels than females.\textsuperscript{46}

About one in every seven secondary school students who participated in this study were currently drinking alcohol. While this may be relatively low compared to other regions of the world,\textsuperscript{1} it is still a course of concern. For example, while alcohol is less consumed in Africa, the age-standardised alcohol-attributable burden of disease and injury is still the highest.\textsuperscript{7} The risk of addiction, alcohol use disorder, and morbidity from alcohol use is even higher when the habit is initiated at a younger age.\textsuperscript{5,7}

This study has provided empirical information on cigarette and alcohol use among a nationally representative sample of Nigerian school-going adolescents; however, it is not without limitations. Study participants were not recruited from the South-East region, one of the six geopolitical regions in the country and dominated by the Igbo tribe, potentially affecting the generalizability of the study findings to this region. However, it is unlikely to constitute a problem because the study findings did not conflict with findings from similar studies conducted in the region.\textsuperscript{10,12,28,47–49} The sampling technique did not consider the potential urban vs rural differences in the study outcomes. Although, a recent review of cigarette and alcohol use among this population in Nigeria did not report any significant differences between participants in urban and rural communities.\textsuperscript{10,45} This was a cross-sectional study and cannot determine causality. However, since our aim was not to determine causality but associated factors, we do not believe it constitutes a problem in this study. There is a risk of misreporting, but we assured the students that the questionnaires were anonymous and their responses could not be traced back to them.

CONCLUSIONS
The prevalence of current cigarette and alcohol use among Nigerian secondary school students was high, suggesting an increase in cigarette smoking in the last decade. The study showed a strong association between cigarette smoking and alcohol use, and the male gender is a predictor of both habits. Other predictors of current cigarette smoking were tobacco harm perception and school-related factors, but further studies are needed to understand the school-related associations better.

ACKNOWLEDGEMENTS
The authors of this study appreciate all the study participants for their time. The technical assistance of Dr Nosayaba Osazuwa-Peters, Mrs Precious A. Kanmodi, and Mr Suleiman Yusuf Musa regarding this study is duly appreciated. The authors also appreciate Cephas Health Research Initiative Inc. for making this study possible.

CONFLICT OF INTEREST
The authors have no conflict of interest to declare.

REFERENCES
1. WHO. Global status report on alcohol and health 2018 [Internet]. World Health Organization. 2018 [cited 2022 Jan 1]. Available from: https://www.who.int/publications/i/item/9789241565639
2. Mbulo L, Ogbonna N, Olarewaju I, et al. Preventing tobacco epidemic in LMICs with low tobacco use — Using Nigeria GATS to review WHO MPOWER tobacco indicators and prevention strategies. Prev Med (Baltim). 2016 Oct 1;91:S9–15.
3. US Department of Health and Human Services. The Health Consequences of Smoking- 50 Years of Progress: A Report of the Surgeon General [Internet]. US Department of Health and Human Services. Atlanta, GA; 2014. Available from: http://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm
4. Hurley LL, Taylor RE, Tizabi Y. Positive and Negative Effects of Alcohol and Nicotine and Their Interactions: A Mechanistic Review. NeuroTox Res [Internet]. 2012 Jan [cited 2021 Dec
13. **Osonuga, Ogunmoroti BD, Osonuga A, Da’costa A**, Alcohol use among secondary school students in Nigeria: A worrisome trend. New Niger J Clin Res [Internet]. 2019 [cited 2021 Sep 29];8(14):54. Available from: https://www.mdcan- uath.org/article.asp?issn=2250-9688;year=2019; volume=8;issue=14;spage=54;epage=59;aulast=Osonuga

14. **Kanmodi KK, Fagbule OF, Aladelusi TO**, Prevalence of shisha (waterpipe) smoking and awareness of head and neck cancer among Nigerian secondary school students: A preliminary survey. Int Public Heal J. 2018;10(2):209–214.

15. UNICEF. Progress for Every Child in the SDG Era dashboard 2019 [Internet]. New York; 2019. Available from: https://data.unicef.org/resources/progress-for-every-child-in-the-sdg-era-dashboard-2019/

16. **Eze CT, Okpala CS and, Ogbodo CJ**, Patterns of Inequality in Human Development Across Nigeria’s Six Geopolitical Zones. J Dev Ctries Stud [Internet]. 2014;4(8):97–101. Available from: www.iiste.org

17. World Bank. Nigeria - Secondary School Starting Age (years) - 1970-2019 [Internet]. Trading Economics. 2020 [cited 2020 Aug 22]. Available from: https://tradingeconomics.com/nigeria/secondary-school-starting-age-years-wh-data.html

18. **Sule ID, Emmanuel HA, Alabi CT, et al.**, Thousands of pupils skip primary 5 and 6 to JSS1 [Internet]. Daily Trust. 2019 [cited 2020 Aug 22]. Available from: https://dailytrust.com/thousands-of-pupils-skip-primary-5-and-6-to-jss1

19. **Adesina MA, Kanmodi KK, Fagbule OF, Ogunmuko T**, Unfavorable family background is associated with smoking at youthful age. Int J child Heal Hum Dev. 2019;12(2):139–144.

20. **Thun M**, Peto R, Boreham J, Lopez AD. Stages of the cigarette epidemic on entering its second century. Tob Control [Internet]. 2012 Mar 1 [cited 2014;4(8):97–101. Available from: /pmc/articles/PMC3960066/21. **Ekanem I, Asuzu M, Anunobi C, et al.** Prevalence of tobacco use among youths in five centres in Nigeria: A global youth tobacco survey (GYTS) approach. J Community Med Prim Heal Care. 2010 Jul 26;22(1/2):62–67.

22. **Isip U**, Calvert J. Analysing big tobacco’s global youth marketing strategies and factors influencing smoking initiation by Nigeria youths using the theory of triadic influence. BMC Public Health [Internet]. 2020 Mar 20 [cited 2021 Dec 30];20(1). Available from: https://pubmed.ncbi.nlm.nih.gov/32197659/

23. **Chido-Amajuoyi OG, Mantey DS, Clendennen SL, Perez A**, Association of tobacco advertising, promotion and sponsorship (TAPS) exposure and cigarette use among Nigerian adolescents: Implications for current practices, products and
24. Ukwaue F, Ogbuabor C, Okiche E. Tobacco Control Legislation and Policy in Nigeria: Much Barking without Biting [Internet]. Elixir Internation Journal. 2018 [cited 2020 Jun 16]. 49641–49651. Available from: https://www.researchgate.net/publication/322790176_Tobacco_Control_Legislation_and_Policy_in_Nigeria_Much_Barking_without_Biting

25. Oladepo O, Oluwasanu M, Abiona O. Analysis of tobacco control policies in Nigeria: Historical development and application of multi-sectoral action. BMC Public Health [Internet]. 2018 Aug 15 [cited 2020 Jun 8];18(S1):959. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5831-9

26. Tezera N, Endalamaw A. Current Cigarette Smoking and Its Predictors among School-Going Adolescents in East Africa: A Systematic Review and Meta-Analysis. Int J Pediatr (United Kingdom). 2019.

27. Chido-Amajuoyi OG, Fueta P, Mantey D. Age at Smoking Initiation and Prevalence of Cigarette Use Among Youths in Sub-Saharan Africa, 2014-2017. JAMA Netw Open [Internet]. 2021 May 3 [cited 2021 Dec 30];4(5):e218060–e218060. Available from: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2779688

28. Itanyi IU, Onwasigwe CN, Ossip D, et al. Predictors of current tobacco smoking by adolescents in Nigeria: Interaction between school location and socioeconomic status. Tob Induc Dis [Internet]. 2020 Mar 3 [cited 2020 Dec 24];18(13). Available from: https://doi.org/10.18332/tid/117959

29. Donatus OO, Casmir O, Anyim OB, et al. Correlates of Tobacco and Marijuana Use among Urban Dwellers in Enugu, Nigeria. Open J Prev Med [Internet]. 2019 Jul 24 [cited 2022 Jan 5];9(7):80–94. Available from: http://www.scirp.org/journal/PaperInformation.aspx?PaperID=93893

30. Gana GJ, Idiris SH, Sabitu K, et al. Prevalence and perception of cigarette smoking among out of school adolescents in Birnin Kebbi, North-western Nigeria. Pan Afr Med J [Internet]. 2018 [cited 2019 Mar 28];30. Available from: http://www.panafricamed-journal.com/content/article/30/304/full/

31. Okagua J, Opara P, Alex-Hart BA. Prevalence and determinants of cigarette smoking among adolescents in secondary schools in Port Harcourt, Southern Nigeria. Int J Adolesc Med Health [Internet]. 2016 Jan 1 [cited 2018 Apr 19];28(1):19–24. Available from: https://www.degruyter.com/view/j/ijamh.2016.28.issue-1/ijamh-2014-0066/ijamh-2014-0066.xml

32. Centers for Disease Control and Prevention. The Tobacco Industry’s Influences on the Use of Tobacco Among Youth. In: Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General [Internet]. Atlanta (GA): Centers for Disease Control and Prevention, USA; 2012 [cited 2019 Dec 28]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK99238/

33. Alao I. Counselling and Nigeria National Policy on Education: The question of relevance and competence. Niger J Guid Couns [Internet]. 2009 Nov 10 [cited 2022 Jan 1];14(1). Available from: https://www.ajol.info/index.php/njgc/article/view/47648

34. Gaete J, Ortúzar C, Zitko P, Montgomery A, Araya R. Influence of school-related factors on smoking among Chilean adolescents: A cross-sectional multilevel study. BMC Pediatr [Internet]. 2016 Jun 9 [cited 2021 Dec 31];16(1):1–9. Available from: https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-016-0612-z

35. Jiang N, Lee YO, Ling PM. Association between tobacco and alcohol use among young adult bar patrons: A cross-sectional study in three cities. BMC Public Health [Internet]. 2014 May 24 [cited 2021 Dec 31];14(1):1–9. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-14-500

36. Tsilianni IG, Vardavas CI, Bouloukaki I, et al. The association between alcohol and tobacco use among elementary and high school students in Crete, Greece. Tob Induc Dis [Internet]. 2012 Sep 25 [cited 2021 Dec 31];10(September). Available from: http://www.tobaccoinduceddiseases.com/content/10/1/15

37. Pelucchi C, Gallus S, Garavello W, et al. Cancer Risk Associated with Alcohol and Tobacco Use: Focus on Upper Aero-digestive Tract and Liver. Alcohol Res Heal [Internet]. 2006 [cited 2021 Dec 31];29(3):193. Available from: /pmc/articles/PMC6527045/

38. Hart CL, Davey Smith G, Gruer I, Watt GC. The combined effect of smoking tobacco and drinking alcohol on cause-specific mortality: A 30 year cohort study. BMC Public Health [Internet]. 2010 Dec 24 [cited 2021 Dec 31];10(1):1–11. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-10-789

39. Guo L, Deng J, He Y, et al. Alcohol use and alcohol-related problems among adolescents in China: A large-scale cross-sectional study. Medicine (Baltimore) [Internet]. 2016 [cited 2021 Dec
40. Obadeji A, Kumolalo BF, Oluwole LO, et al. Substance Use among Adolescent High School Students in Nigeria and Its Relationship with Psychosocial Factors. J Res Health Sci [Internet]. 2020 Mar 1 [cited 2022 Jan 1];20(2):e00480. Available from: /pmc/articles/PMC7585748/

41. Alex-Hart B, Opara P, Okagua J. Prevalence of alcohol consumption among secondary school students in Port Harcourt, Southern Nigeria. Niger J Paediatr. 2014 Nov 28;42(1):39.

42. Ajayi AI, Owolabi EO, Olajire OO. Alcohol use among Nigerian university students: prevalence, correlates and frequency of use. BMC Public Health [Internet]. 2019 Jun 13 [cited 2022 Jan 1];19(1). Available from: /pmc/articles/PMC6567597/

43. Adebayo DO, Ninggal MT, Adegoke AA. Relationship between Gender of School-Going Adolescents and Alcohol Consumption in Ilorin, Nigeria. Educ Sustain Soc. 2018 Jan 1;1(2):08–10.

44. Hormenu T, Hagan Jnr JE, Schack T. Predictors of alcohol consumption in school adolescents in the Central Region of Ghana: A baseline information for developing cognitive-behavioural interventions. PLoS One [Internet]. 2018 Nov 1 [cited 2022 Jan 1];13(11):e0207093. Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0207093

45. Dumbili EW. A review of substance use among secondary school students in Nigeria: Implications for policies [Internet]. Vol. 22, Drugs: Education, Prevention and Policy. Informa Healthcare; 2015 [cited 2021 Dec 31]. 387–399. Available from: https://www.tandfonline.com/doi/abs/10.3109/09687637.2015.1041455

46. Dir AL, Bell RL, Adams ZW, Hulvershorn LA. Gender Differences in Risk Factors for Adolescent Binge Drinking and Implications for Intervention and Prevention. Front Psychiatry. 2017 Dec 22; 8: 289.

47. Egbuonu I, Ezechukwu C, Chukwuka J, Uwakwe R. Substance Abuse Among Female Senior Secondary School Students In Anambra State South Eastern Nigeria. Niger J Clin Pract [Internet]. 2005 Mar 15 [cited 2021 Dec 29];7(2):53–55. Available from: https://www.ajol.info/index.php/njcp/article/view/11181

48. Ogah O, Onyenororo U, Chukwunye I, et al. Awareness and perception of harmful effects of smoking in Abia State, Nigeria. Niger J Cardiol [Internet]. 2015 [cited 2018 Apr 19];12(1):27. Available from: http://www.nigjcardiol.org/text.asp?2015/12/1/27/148483

49. Nwafor CC, Ibeh CC, Agwu EN, Chukwu JN. Assessment of pattern of cigarette smoking and associated factors among male students in public secondary schools in Anambra State, Nigeria. Niger J Med. 2012;21(1):41–47.